THE JOURNAL OF GAS LIGHTING
WATER SUPPLY & SANITARY IMPROVEMENT

VOL. LVIII. No. 1485.] LONDON, OCTOBER 27, 1891. [43RD YEAR. Price 6d.

WOLSTON'S Paste and Ready Mixed for Use.
Guaranteed Free from Adulteration. **TORBAY PAINTS.**
FOR GASHOLDERS, &c., &c.
The Original "Torbay Paints"
As supplied during the present and many preceding years to the LONDON GASLIGHT & COKE COMPANY.
Special Quotations to Gas Companies.
TORBAY & DART PAINT Co., Ld.,
DARTMOUTH, DEVON,
And 23, Gt. George St., Westminster, S.W.

— ESTABLISHED 1830. —
PARKER & LESTER,
Manufacturers & Contractors.
THE ONLY MAKERS OF
PATENT ANTIMONY PAINT,
Parker's Imperial Black Varnish,
Oxide Paints, Oils, and General Stores for Gas and Water Works.
WORKS:
ORMSIDE STREET, OLD KENT ROAD, LONDON.
Ashmore, Benson, Pease, & Co., Ld.,
STOCKTON-ON-TEES,
Manufacturing Gas Engineers.
See Advertisements, p. 741, and last White Page.

CEMENT
EARLE'S
BEST
Portland Cement
MANUFACTURED BY
GEO. & THOS. EARLE,
HULL.
Offices: 7, 8, & 9, PIER STREET.
Works: WILMINGTON.
STOREAGE CAPACITY 10,000 Tons.
ESTABLISHED 1811—OVER THREE QUARTERS OF A CENTURY.
Telegraphic Address: "CEMENT HULL."

NORTON'S PATENT
"ABYSSINIAN" & ARTESIAN TUBE WELLS,
FOR TOWN WATER-WORKS AND OTHER SUPPLIES.
The following Town Water-Works Supplies have been obtained by this System, viz.:—Abbott's Langley, Aldershot, Alnwick, Cirencester, Hertford, Lechlade, St. Albans, Shrewsbury, Skegness, Southampton, Stony Stratford, Swansea, Wallingford, Watford, West Worthing, Wimborne, &c.
LE GRAND & SUTCLIFF,
HYDRAULIC ENGINEERS, 100, BUNHILL ROW, LONDON, E.C.

SELF-CONTAINED DUST-FUEL FURNACE.
MELDRUM'S PATENT.

Extract from the *Smethwick Telephone,* June 13, 1891.

GAS COMMITTEE.

"The Manager [B. W. Smith, Esq.] reported that the adoption of MELDRUM'S PATENT FURNACES, he estimated, had resulted in a saving of 150 tons of Slack during the nine months they had been at work in the Boiler-House, and 360 tons of Slack during four months in the Retort-House; the fuel used in place of slack being the fine coke dust which formerly had to be carted or boated away at considerable expense."

MELDRUM BROS., Engineers,
ATLANTIC WORKS, 13, CITY ROAD, MANCHESTER.

DANIEL HOWARD,

(Successor to the late BENJ. WHITEHOUSE),

GASHOLDER & BOILER WORKS,

WEST BROMWICH, NEAR BIRMINGHAM

(ESTABLISHED 1765),

MANUFACTURER OF TELESCOPIC AND SINGLE GASHOLDERS,

WROUGHT AND CAST IRON TANKS FOR DITTO,

PURIFIERS, CONDENSERS, SCRUBBERS, HYDRAULIC MAINS, and all kinds of GAS APPARATUS,

Wrought-Iron Roofs, Bridges, Girders, &c.,

Steam, Hot Water, and Range Boilers, Tanks, Cisterns, Boats, and all kinds of Wrought-Iron Work.

DRAWINGS, SPECIFICATIONS, AND ESTIMATES SUPPLIED ON APPLICATION.

EDWARD COCKEY & SONS, LIMITED,

ENGINEERS & CONTRACTORS FOR GAS-WORKS.

TELEGRAPHIC ADDRESS: "COCKEYS FROME."

THE IRON-WORKS,
FROME.

Messrs. COCKEY desire to draw the attention of Gas Engineers and Managers to their new form of GAS WASHER, which, by a recent patent, converts their HORIZONTAL Washer into one of a VERTICAL form.

The principle is the same as in the horizontal one, which has now been before the profession for a number of years, and where adopted is giving unqualified satisfaction.

The Washer is entirely automatic in its action, and does not therefore need any motive power—an advantage which will be apparent to all.

It is made in all sizes, from **25,000 TO 3,000,000 FEET PER DAY**; and Messrs. COCKEY invite inquiries, which shall have early attention.

March, 1891.

PRICES ON APPLICATION TO THE SOLE MAKERS.

THE IRON-WORKS, FROME SELWOOD, SOMERSET.

HIGHEST AWARDS—LONDON, PARIS, COLOGNE, VIENNA, MELBOURNE, AND OTHERS.

—11 MEDALS.—

MANUFACTURERS OF TUBES AND FITTINGS OF EVERY DESCRIPTION.

WROUGHT-IRON OR STEEL MAINS UP TO 6 FEET DIAMETER, FOR GAS, WATER, OIL, OR OTHER PURPOSES.

SCREWING TACKLE, BOILER MOUNTINGS, VALVES, COCKS, ETC.

LONDON:
108, Southwark Street.

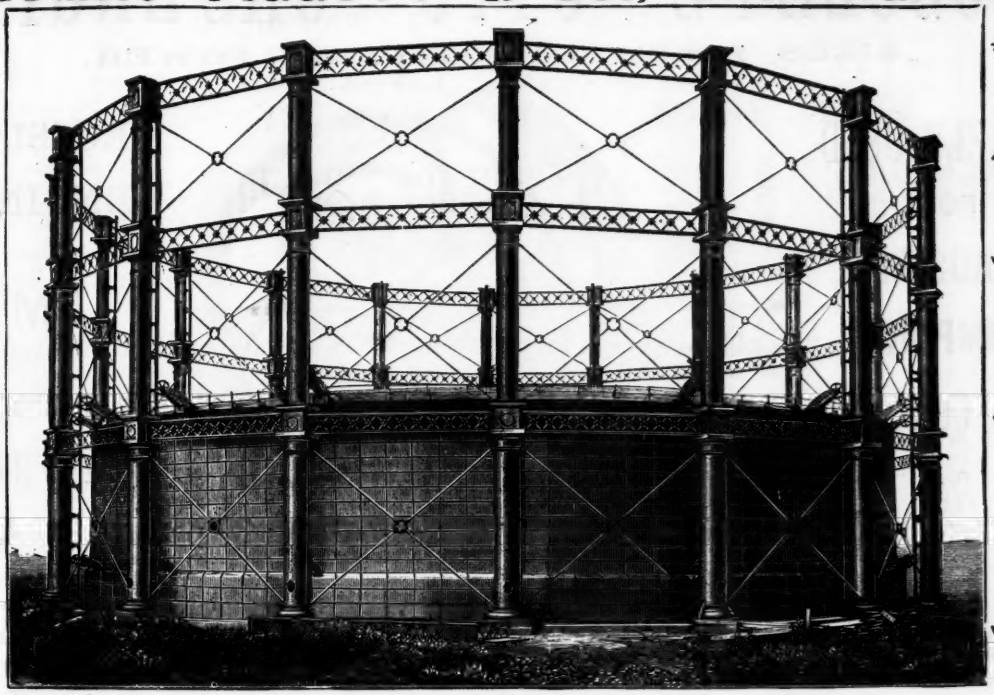
BIRMINGHAM:
114, Colmore Row.

LEEDS:
6, Mark Lane, New Briggate.

THOMAS PIGGOTT & CO., BIRMINGHAM.

LONDON OFFICE: ST. THOMAS APOSTLE, E.C.

GAS PLANTS, BOILERS, ENGINES, PUMPS, ROOFS, RETORT FITTINGS, ETC.



TELEGRAPHIC ADDRESS: ATLAS, BIRMINGHAM.

WELDED & RIVETED PIPES, FOUL MAINS, RETORT-LIDS, WROT & CAST TANKS, PURIFIERS.

OVER 500 GASHOLDERS HAVE BEEN SUPPLIED AND ERECTED,

INCLUDING THOSE SUPPLIED TO THE FOLLOWING GAS COMPANIES AND CORPORATIONS:

BATH.	BOLTON.	BRISTOL.	CHELTENHAM.	LEAMINGTON.	PRESTON.	SHEFFIELD.
BELFAST.	BOMBAY.	BRISBANE.	HARTLEPOOL.	LIVERPOOL.	READING.	STOCKHOLM.
BECKTON.	BRADFORD.	CARDIFF.	LEEDS.	NOTTINGHAM.	RIO GRANDE.	SYDNEY.
BIRMINGHAM.	BRIGHTON.	COVENTRY.	LEICESTER.	OLDHAM.	SOUTH METRON.	VIENNA.

GAS COAL.

BEST

REAL OLD SILKSTONE GAS COAL,

Address, THE STRAFFORD COLLIERIES COMPANY,

Near BARNSLEY, SOUTH YORKSHIRE.

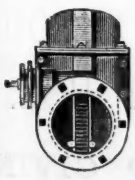
NEWTON, CHAMBERS, & CO., LIMITED

THORNCLIFFE IRON-WORKS, near SHEFFIELD,

MANUFACTURERS OF

SLIDE VALVES,
WITH RACK & PINION,
OR
Internal or External
SCREWS, of all Sizes.

GASHOLDERS,
AND
Gasholder Tanks.



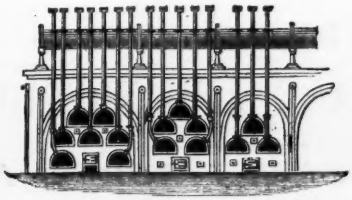
CAST-IRON RETORTS,

RETORT-BED FITTINGS,

And Retort-House Appliances

of every description.

Iron Roofs, Columns, Girders, Floor Plates and Tools, &c.

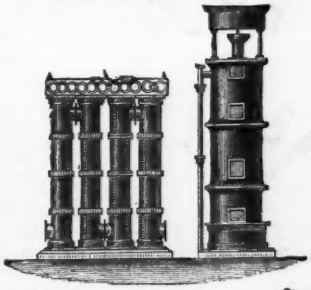


WROUGHT AND CAST IRON

CONDENSERS,

SCRUBBERS, & WASHERS,

TAR AND LIQUOR PUMPS, &c.



PATENT

CENTRE VALVES

for working Purifiers.

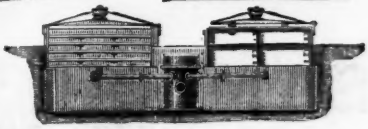
Also Bye-Pass & Stop Valves.

PURIFIERS with Planed Joints,

HAND and HYDRAULIC LIFTING GEAR, CAST-IRON MAINS and SPECIALS,

WOOD GRIDS.

CAST AND WROUGHT IRON TANKS AND CISTERNS.



DESIGNS, SPECIFICATIONS, AND ESTIMATES FREE.

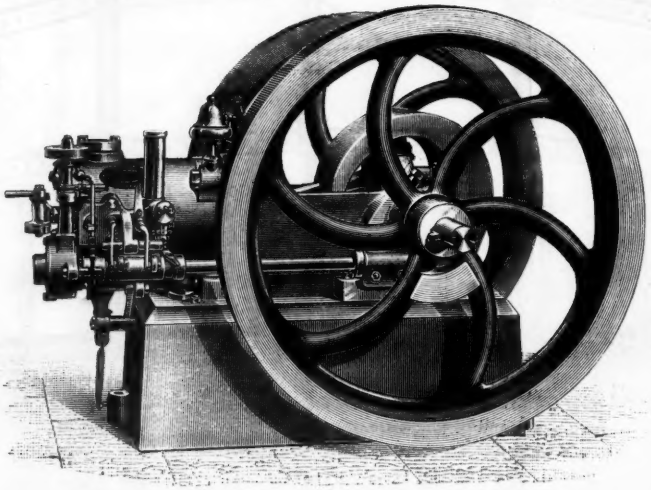
Pig Iron (*Special Quality*) for ENGINE CYLINDERS, &c.

GAS COAL FAMOUS FOR ITS UNRIVALLED EXCELLENCE.

CROSSLEY'S "OTTO" GAS-ENGINE.

SIZES, 2-MAN TO 200-HORSE POWER.

LARGELY USED FOR **EXHAUSTING, PUMPING,** Coke Crushing, &c.



CROSSLEY'S ENGINES, Combined with **PUMPS** FOR *TOWNS' SUPPLY, SEWAGE, &c., &c.*

CROSSLEY'S NEW HIGH-SPEED ENGINE FOR DIRECT ELECTRIC LIGHTING.

CROSSLEY BROS., LTD., OPENSHAW, MANCHESTER.

HARRIS & PEARSON,

STOURBRIDGE, ENGLAND.

MANUFACTURERS OF

FIRE-CLAY GAS-RETORTS, FIRE-BRICKS, LUMPS, & TILES of Every Description.

GLAZED BRICKS AND PORCELAIN BATHS.

LEAKY AND STICKING SLIDES ENTIRELY AVOIDED.

EASILY MANIPULATED.

ESPECIALLY SUITABLE FOR PURIFIERS.

CUTLER'S PATENT WATER-VALVES FOR PURIFIERS.

LEAKAGE IMPOSSIBLE.

NEAT AND COMPACT.

NO DETERIORATION THROUGH AGE AND FREQUENT USE.

IN USE AT NUMBERS OF LARGE WORKS, AND GIVING GREAT SATISFACTION.

SAML CUTLER & SONS, Engineers,

GAS AND WATER WORKS CONTRACTORS.

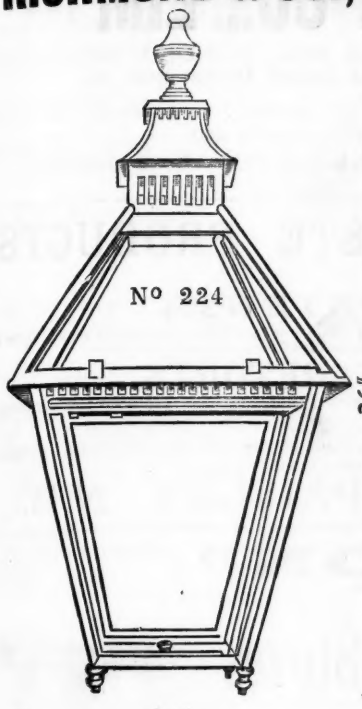
WORKS: **PROVIDENCE IRON-WORKS, MILLWALL, LONDON, E.**
Telegrams: "CUTLER, MILLWALL, LONDON." *Telephone:* 5059.

OFFICES: **16, GT. GEORGE STREET, WESTMINSTER, S.W.**
Telegrams: "RETORTUS, LONDON," *Telephone:* 3223.

A.B.C. CODE USED, 4TH EDITION, 1883.

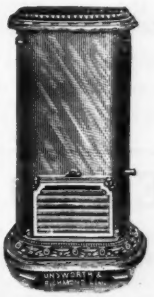
RICHMOND & CO., LTD., GAS APPARATUS MANUFACTURERS, WARRINGTON.

Sole Agents for Webb's High-Power Shop and Street Lamps.



WEBB'S IMPROVED PUTTYLESS LAMP.

	EXTREME WIDTH. INS.	INS.
No. 224. **Puttyless Street Lamp,** all Copper Frame, **with Lighting Door.** The glass being fixed in our improved grooved bars, new squares can be inserted in much less time, and less wear and tear to the Lamp, than by the old method. Glazed all Clear Glass and painted any Approved Colour.	16½	15
	21/6	19/6
Extra Opal Top Squares, 2/3 per Lamp.		
Extra Pins and Nuts, 1/6.		
No. 225. **Ordinary Puttied Lamp,** as above	20/-	18/-



New List of Heating-Stoves

Ready Oct. 20.

No. **550.**

Made of Blue Coated Steel, with a surface equal to Plate Glass.

Requires no Black Varnish, and can easily be kept Clean with a Dry Duster.

SIZE: 30in. high, 18in. wide over all.

Price, **22s.**

Suitable for Rooms 14ft. square.

No. **560.**

This is a handsome Stove, with Bright Copper Reflector, and body of Bright Blue Coated Steel, fitted with Hot-Air Tubes, suitable for Entrance-Halls, or rooms up to about 18ft. square, and burns with a white flame.

SIZE: 21½in. wide x 16in. deep x 34in. high.

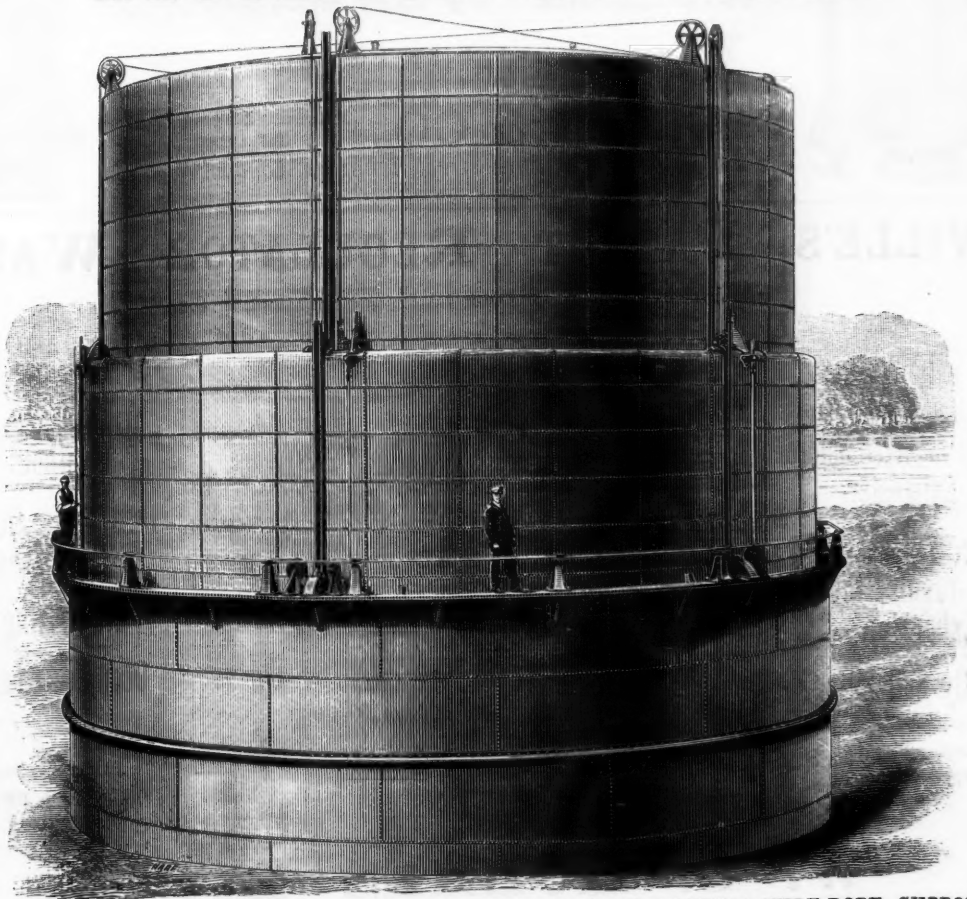
Price, **£2.**

With Cathedral Glass Front,

Price, **£2 15s.**

Splendid Patterns of Square and Hexagonal Lamps in Stock. Write for Lists.

ASHMORE, BENSON, PEASE, & CO., LTD.,
STOCKTON-ON-TEES.



TWO-LIFT GASHOLDER, WITH TANK, WORKING WITH PEASE'S PATENT WIRE-ROPE SUPPORTS.

(From Photograph.)

THE WIGAN COAL & IRON CO., LIMTD.,

Are exclusive Owners of the well-known HAIGH HALL & KIRKLESS HALL GAS COAL COLLIERIES, and supply the Best Wigan Arley Mine Gas Coal, Gas Nuts, Gas Cannel, Cannel Nuts, &c.

MIDLAND DISTRICT OFFICE: 22, TEMPLE ST., BIRMINGHAM—SOLE AGENT: A. C. SCRIVENER.

TELEGRAPHIC ADDRESS: "WIGAN BIRMINGHAM." TELEPHONE No. 200.

LONDON DISTRICT OFFICE: 6, STRAND, LONDON—C. PARKER & SON, SOLE AGENTS.

TELEGRAPHIC ADDRESS: "PARKER LONDON."

SPENT LIMES NO LONGER WASTE PRODUCTS.

Under G. R. HISLOP'S PATENTS

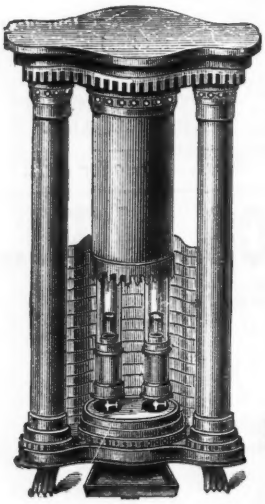
All Spent Limes are most effectually, economically, and continuously recovered, and at from one-third to one-half the cost of New Lime. The results are a surprise to all who have inspected the process, and are entirely satisfactory to all now using it. Descriptive Pamphlet and Terms from Agents as under.

— REGENERATIVE SETTINGS OF RETORTS. —

Hislop's Patent Producer and Patent Charging Appliances offer advantages which are unapproachable, while in every other detail his Settings are confidently recommended as being the most inexpensive and effective possible.

Illustrated Pamphlet and Terms on application to J. E. FISHER, Stourbridge, Agent for England and Wales; to C. M. HAMILTON, Portland Place, Hamilton, Agent for Scotland and Ireland; and for all other Countries to the Patentee,

Geo. R. HISLOP, Gas Engineer, PAISLEY, N.B.



THE "SYPHON" (REGISTERED TITLE.)

(CLARK'S PATENT.)

Hygienic Gas-Heating Stoves

For Use Without a Flue.

NO FLUE REQUIRED. NO SMOKE. NO SMELL.
NO DIRT OR TROUBLE. NO DANGER.

All sulphurous Vapours are condensed inside the Stoves, and passed off as liquid into the tray beneath.

The "SYPHON" Hygienic Gas-Heating Stoves give a pure, equable, and agreeable heat, which can be graduated and sustained at the will of the user. They are so constructed that a moist or dry atmosphere is obtained at pleasure.

They are the Only Safe Stoves for use in Greenhouses, Conservatories, Bed-rooms, &c., and especially suitable for Halls, Sitting-Rooms, Offices, Shops, Schoolrooms, and Theatres.

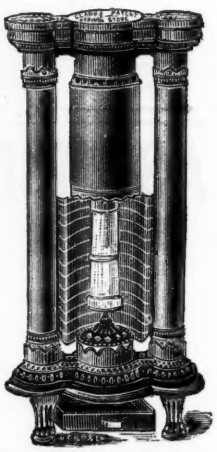
Adopted by the principal Gas Companies throughout the Kingdom.

Illustrated Price Lists on application to

S. CLARK & CO., **Patentees and Makers,**

Syphon Works, Park Street, Islington, London, N.

Telgraphic Address: "Syphon Stoves London."



SAVILLE'S PATENT REGULATOR WASHER

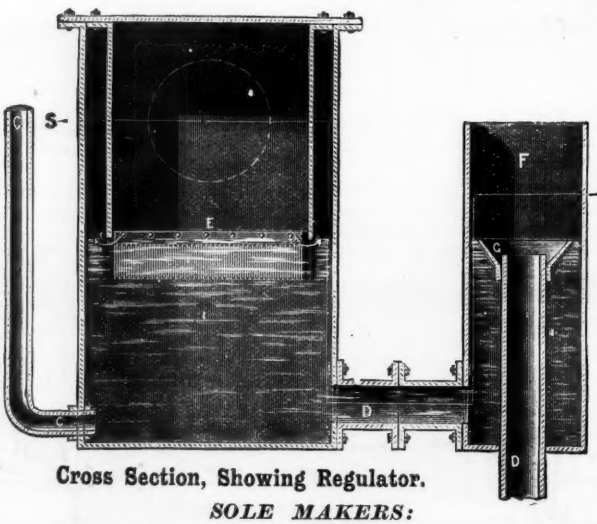
(As described in the JOURNAL OF GAS LIGHTING for Sept. 2, 1890.)

The only Washer without moving parts that can be fixed before an Exhauster.

No more Gas spoilt by over-running the Exhauster.

Perfectly Self-acting.

Particulars and prices on application.



Cross Section, Showing Regulator.

The only safe arrangement to work without Dip.

Less wear and tear on the Exhauster.

No moving parts.

Occupies small space.

State maximum make of Gas per diem.

SOLE MAKERS:

W. C. HOLMES & CO.,

WHITESTONE IRON-WORKS, HUDDERSFIELD.

JOSEPH CLIFF & SONS,

INCORPORATED IN
THE LEEDS FIRE-CLAY COMPANY, Ltd.,

WORTLEY, LEEDS.

LONDON Offices & Depôts:
Baltic Wharf, Waterloo Bridge.

WHARVES NOS. 2 & 4, INSIDE G.N. GOODS YARD, KING'S CROSS, N.

LIVERPOOL:
16, Lightbody Street.

LEEDS:
Queen Street.

MACHINE-MADE RETORTS

Have been made in large quantities for the last twelve years; and during the whole of that time, have been in regular use at most of the largest Gas-Works in the Kingdom. They possess the excellent quality of remaining as near stationary as possible under the varying conditions of their work—a quality which will be appreciated by all Gas Engineers and Managers. The generally expressed opinion is that these Retorts are the very best that are made.

RETORTS CAREFULLY PACKED FOR EXPORT.

Fire-Bricks, Lumps, Tiles, &c., &c., of every description suitable for Gas-Works.

ESTABLISHED MORE THAN A QUARTER OF A CENTURY

WORKS
HUNSLET.
LEEDS

LONDON OFFICE:
60, QUEEN VICTORIA
STREET
E.C.

CLAYTON SON & CO. LTD.

MAKE A

SPECIALTY

OF

GASHOLDERS

AND
MAKERS
OF

REG: TELEGRAPHIC ADDRESS: "GAS LEEDS"

GAS PLANT OF EVERY DESCRIPTION.

R. & J. DEMPSTER,

Engineers, Ironfounders, and Contractors,

GAS PLANT WORKS, NEWTON HEATH, MANCHESTER.

SULPHATE OF AMMONIA PLANTS,

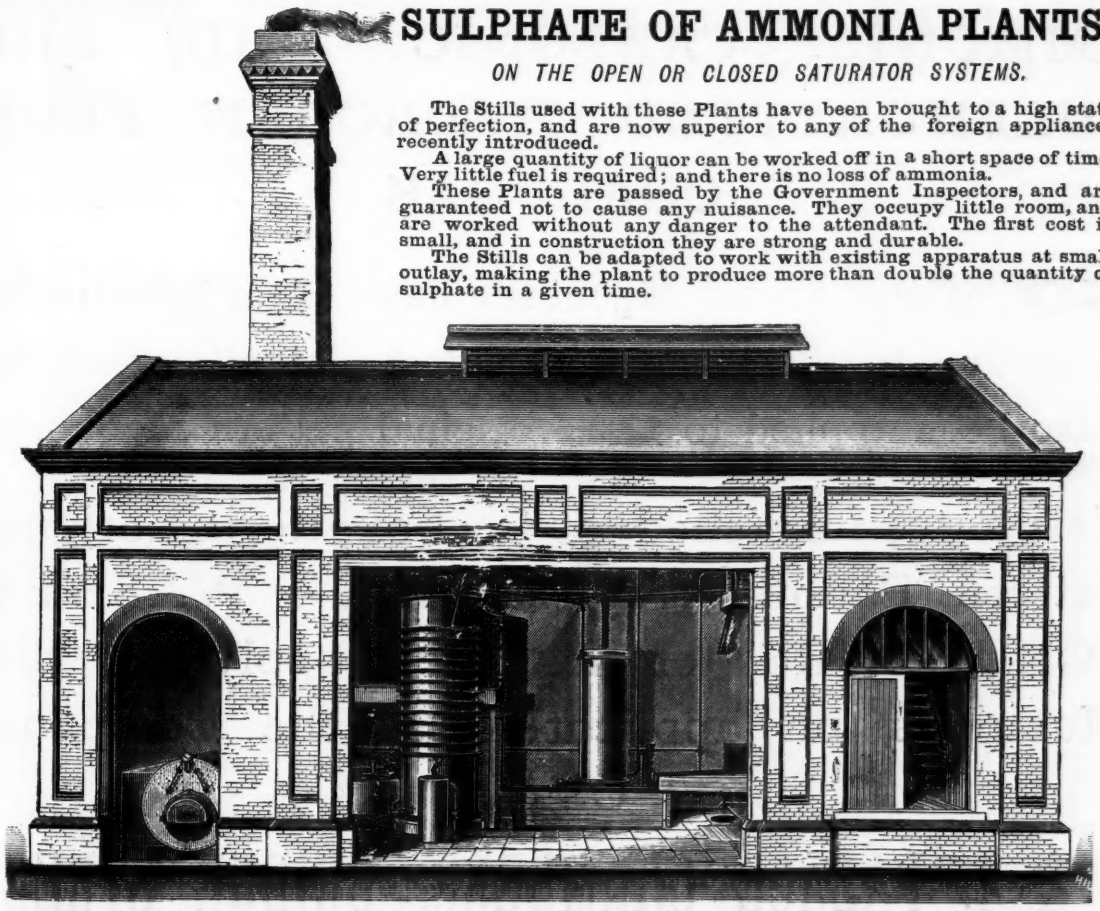
ON THE OPEN OR CLOSED SATURATOR SYSTEMS.

The Stills used with these Plants have been brought to a high state of perfection, and are now superior to any of the foreign appliances recently introduced.

A large quantity of liquor can be worked off in a short space of time. Very little fuel is required; and there is no loss of ammonia.

These Plants are passed by the Government Inspectors, and are guaranteed not to cause any nuisance. They occupy little room, and are worked without any danger to the attendant. The first cost is small, and in construction they are strong and durable.

The Stills can be adapted to work with existing apparatus at small outlay, making the plant to produce more than double the quantity of sulphate in a given time.



FOR ESTIMATES AND ILLUSTRATIONS, APPLY TO THE SOLE MAKERS, R. & J. DEMPSTER.

LONDON OFFICES: 181, GRESHAM HOUSE, OLD BROAD STREET, E.C.

KIRKHAM, HULETT, & CHANDLER,

LIMITED.

(SIDNEY HERSEY, Managing Director.) (J. CHANDLER, Engineer.)

PATENT

"STANDARD" WASHER-SCRUBBER.

430

of these Machines have now been supplied, and several are now in course of erection. These facts are given as evidence of the apparatus being the most efficient of any in the Market for the extraction of

AMMONIA, CARBONIC ACID, AND SULPHURETTED HYDROGEN FROM COAL GAS.

50 of the above Machines have been constructed according to the Company's latest Patent, which has also been applied to **25** original pattern Machines.

Estimates furnished for Cost of altering original pattern Patent "STANDARD" WASHER-SCRUBBERS, or for the supply of New Machines, on application at the Company's Offices,

3 & 4, PALACE CHAMBERS, BRIDGE STREET,

WESTMINSTER, S.W.

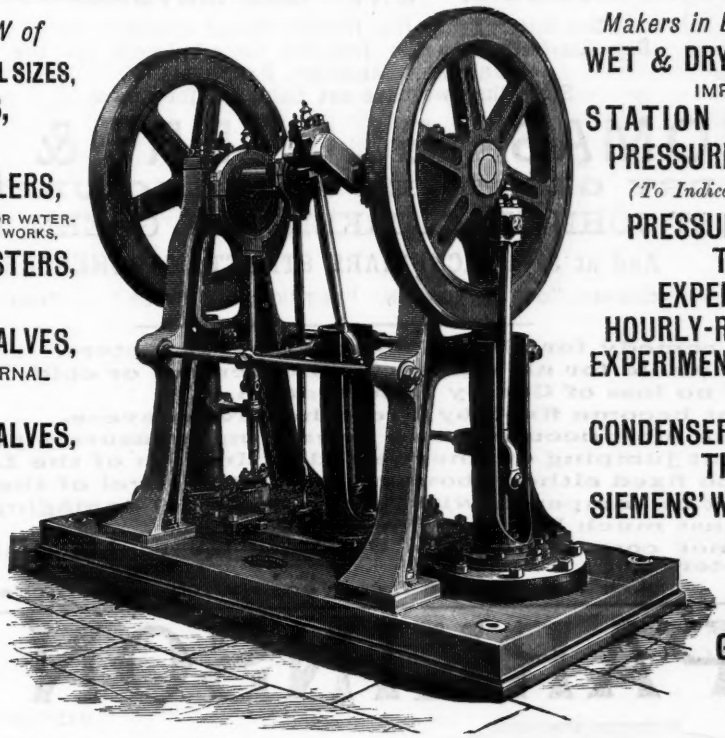
R. LAIDLAW & SON,

GAS AND WATER ENGINEERS.

Manufacturers of **GAS APPARATUS** of every Description.

Makers in GLASGOW of

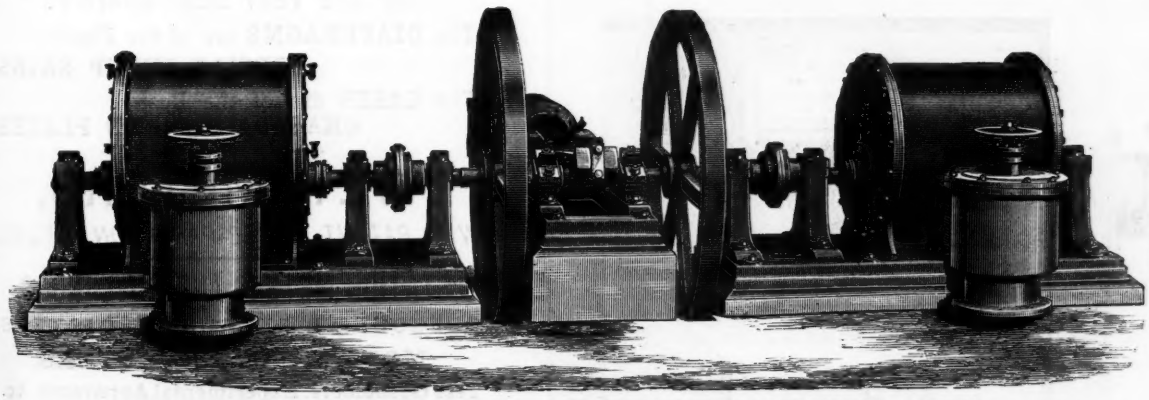
CAST-IRON PIPES, ALL SIZES,
LAMP PILLARS,
STEAM-ENGINES AND BOILERS,
PUMPING ENGINES FOR WATER-WORKS,
BEALE'S GAS EXHAUSTERS,
DOUBLE-FACED SLUICE VALVES,
INTERNAL AND EXTERNAL RACK OR SCREW SLIDE VALVES,
CAST-IRON COLUMNS,
BEAMS, GIRDERS, AND WATER-TANKS,
WROUGHT-IRON TUBES, FITTINGS, &c.



Makers in EDINBURGH of

WET & DRY GAS-METERS,
IMPROVED STATION GOVERNORS,
PRESSURE REGISTERS *(To Indicate New Time)*,
PRESSURE GAUGES,
TEST HOLDERS,
EXPERIMENTAL HOURLY-RATE METERS,
EXPERIMENTAL TEST METERS,
CONDENSER THERMOMETERS,
SIEMENS' WATER-METERS,
STREET LANTERNS,
And all Kinds of
GAS APPARATUS AND FITTINGS, &c.

PUMPING GAS EXHAUSTER AND ENGINE COMBINED. All Sizes.



BEALE'S GAS EXHAUSTERS AND ENGINE COMBINED. All Sizes.

Prices, with full Particulars, will be given on application.

Two Gold Medals, One Silver Medal, One Bronze Medal, and Two Honourable Mentions,

INTERNATIONAL EXHIBITION, EDINBURGH 1886.

ALLIANCE FOUNDRY, **GLASGOW.** | SIMON SQUARE WORKS, **EDINBURGH.** | 6, LITTLE BUSH LANE, **LONDON, E.C.**

ESTABLISHED 1844.] **ORIGINAL MAKERS.** [ESTABLISHED 1844.]

London, 1851. New York, 1853. Paris, 1855. London, 1862.

Dublin, 1865. Paris, 1867.

The SIX MEDALS AWARDED to THOMAS GLOVER for

PATENT DRY GAS-METERS,

The latter being the Highest Medal awarded for Dry Gas-Meters by the Imperial Commissioners for the Universal Exhibition, Paris, 1867.
Since then we have not Exhibited for Prizes.

THOMAS GLOVER & CO.,

DRY GAS-METER MANUFACTURERS,

214 to 222, ST. JOHN ST., CLERKENWELL GREEN, LONDON, E.C.

And at 37, BLACKFRIARS STREET, MANCHESTER.

TELEGRAPHIC ADDRESSES: "GOTHIC LONDON," "GOTHIC MANCHESTER." TELEPHONE No. 6725.

1st—Are a remedy for all the defects of Wet Meters.
2nd—Are suitable for all climates, whether hot or cold.
3rd—Incur no loss of Gas by Evaporation.
4th—Cannot become fixed by Frost, however severe.
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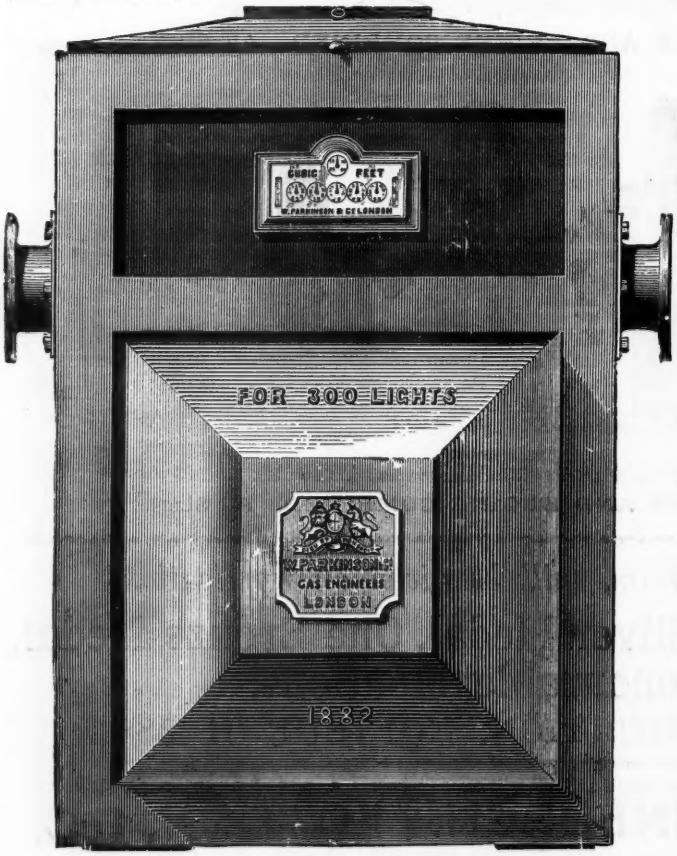

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TO CORRESPONDENTS.

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THE

JOURNAL OF GAS LIGHTING,

WATER SUPPLY, & SANITARY IMPROVEMENT.

TUESDAY, OCTOBER 27, 1891.

A Small Gas "Scare."

THERE has been a nice little game of speculation in progress during the last week or ten days, with leading gas stocks for the counters. We must refer readers to our special article for the details of the extent to which Gaslight and Coke and other sterling property of this description has been knocked about. The usual rumours are going the round as to fortunes having been made and lost over these fluctuations, which will very soon cease, and leave the nominally-agitated stocks just as firmly priced as ever. The remarkable thing is that the conclusion of the holidays should have been signalized by such a "flutter" in a class of investments which were certainly neither more nor less valuable intrinsically in October than they were in September, or than they will be next month. Several reasons are assigned for this spasmodic movement; one being that the Chairman of a Metropolitan Gas Company gave the "bears" a chance by delivering himself of a despondent speech, and another running to the effect that the Chairman of a new Electric Lighting Company spoke in a totally different strain. Some people, because they themselves pay more attention to facts than to sayings, ridicule these proffered explanations of an undeniable effect, and so recommend themselves to similarly-minded folk. They point out that what the Chairman of a public Company chooses to say cannot alter circumstances; and they prove easily enough that there is no sufficient reason for the recent agitation of the gas share market. This is undoubtedly the sensible view to take; but some allowance must be made for human nature, and particularly for stock-jobbing human nature, when examination is made into the hidden causes of overt results. We believe that the more speculative division of the order of financial operators who give their attention to industrial stocks, were feeling absolutely rusty for want of a little excitement. They had their eyes upon gas shares, and marked the growth of disturbing influences in the shape of depleted balances, while the electric light companies appeared to be waiting on their rivals' track. Then the "psychological "moment" came, and somebody took advantage of it. The "bears" saw their opportunity; and the thing was done.

We should be sorry to hear that any true investors had been frightened into parting with gas shares in consequence of what has been going on during the past few days. The whole thing has been so palpably factitious, that it is difficult to treat the episode seriously. But the occurrence, whether its consequences have been grave or trivial, has its lesson, which is that in the interest of their own shareholders, as well as of the public in general, gas directors cannot afford to trifle with the reputation of the property committed to their care. This little "scare" will have at least one rather unfortunate result—it will induce boards of directors who carry on their concerns with an eye to the investment market, as they must all do to a certain extent, to be less reluctant to increase gas prices, whenever by so doing they can be satisfied that they are safeguarding the resources of their undertakings. If investors are seen to take alarm when reserves are being freely dipped into, directors will be more chary of countenancing this process, which is not without its redeeming side in the estimation of those far-sighted gas administrators who desire to accentuate the fact that cash reserves are shareholders' own property. It is a chief care of directors to ensure a supply of cheap capital for their companies. It makes all the difference to a gas undertaking whether new capital costs 5 or 6 per cent.; and therefore, whatever else they may or may not do, gas directors must be careful in this regard, or they may easily muddle away the strength of the business which lies at their discretion. It will never do for gas property to fluctuate often as it lately did. The Directors of the Companies affected may well say to their proprietors, "If you cannot trust us to look after your interests to the "extent of letting us make use of reserves in part payment "of the dividends we recommend, say so at the proper "time; but, after you have heard our story and sanctioned "our proposals, do keep cool, and stand aloof from the "manœuvres of speculators who would wreck any pro-"perty to snatch a bit of plunder for themselves." If it is to be understood that reserves are the key of the position, then reserves must be had; but it seems more than a little ridiculous that undivided balances should frequently be held so sacred.

With regard to the part played by electric lighting in the recent affair, it is difficult to write patiently. The only possible justification that could be pleaded for paying more regard now to the prospective effects of the introduction of electric light into the City than would have been thought advisable a month ago, is the fact that a new Company has been started to compete, under great disadvantages, with other Companies that are at present earning nothing. The Chairman of this new undertaking made a great show of the promises of support which the management of the concern has received; but what do these really amount to? He asserted that these promises included the lighting of the Post Office, the Mansion House, the Guildhall, and a bank or two. The spontaneity of these

offers of assistance may be judged from the following considerations. The lighting of the Post Office is answered for by Mr. W. H. Preece, who was consulted by the City authorites about the preliminary stages of this same electric lighting scheme; that of the Mansion House and the Guildhall is subject to the influence of the Lord Mayor, who was one of the promoters of the Company; and the Company's own bankers and brokers may well have sent in the other encouraging communications. Are gas stockholders to be frightened into parting with their property by such turnip-headed ghosts as these? The idea is incredible.

The Midland Association Meeting.

THE members of the Midland Association of Gas Managers met in Birmingham last Thursday, under the presidency of Mr. R. O. Paterson, of Cheltenham, who took the chair in the unavoidable absence of the retiring President, Mr. C. Stafford Ellery. There was a fair attendance at the meeting; and a good deal of business was transacted. Mr. W. Littlewood was chosen President for the ensuing year; and Mr. C. Meiklejohn was elected Honorary Secretary in place of Mr. J. S. Reeves, who retired from that office, in which he has increased his reputation for business capacity. The technical portion of the proceedings was supplied by Mr. H. Hack, who gave the paper upon Elliott's system of continuous carbonization which will be found in full elsewhere. This was a really important contribution to the literature of coal carbonization, not only for its matter, but as an example of the way in which an experimental process of gas making requires to be treated in order to determine the relation between promise and performance. It is admitted by Mr. Hack that he was so favourably impressed with what he saw of the working of the Elliott system, under the supervision of the inventor, at the Ludlow Gas-Works, that he felt justified in recommending his Committee to sanction a trial of it upon a slightly more extended scale in connection with the experimental plant at the Swan Village station of the Birmingham Corporation Gas Committee, where better facilities existed for ascertaining the results of its working than were available at the home of the system in Ludlow. Every care seems to have been taken to give the Elliott plant fair play at Swan Village. The inventor's own constructors furnished the ironwork, and he settled the arrangement of the apparatus in consultation with them. Mr. Hack candidly confesses that he could not pull down arches to accommodate what might be regarded as the best possible arrangement of the Elliott apparatus. But he did enough to enable the principle to be tested; and, besides, it may be remarked that a little adaptability to different retort-houses ought to be an essential feature of carbonizing plant designed for universal adoption. After all was done, however, the Swan Village trials were the reverse of successful, as the paper abundantly shows. The result is, of course, disappointing to Mr. Elliott, whose ingenuity and perseverance, as Mr. Hack well says, deserve a better reward than he is able to promise him from these experiments. The best that can be said in the circumstances is that some useful lessons are to be learnt from the trials, which may bear good fruit another day. It appears from the paper that Mr. C. C. Carpenter is trying the Elliott system at Vauxhall, with a difference, which may result in something that will modify the judgment pronounced upon it at Swan Village. Perhaps Mr. Carpenter will have a communication to make on this subject at a future time. For the present, a Committee of the Midland Association has been appointed to investigate and report further upon the discrepancy between the Ludlow promise and the Birmingham performance. Mr. Hack's paper will certainly bear attentive study for other reasons than its description of the working of the Elliott system. It contains much suggestive matter relating to points of carbonizing practice which are only incidentally connected with this system; and a good deal that the author has to say on these subjects may form the basis of further investigation and experiment. It has been Mr. Hack's unhappy fate to have as much experience of the nuisance of stopped ascension-pipes as any gas manager in England; and he has therefore the greatest cause to study, by every possible light that comes to hand, the unsolved problem of the destructive distillation of coal in closed retorts.

One more observation we must be permitted to make upon this topic. It is stated in the beginning of Mr. Hack's paper that when it became known to his professional brethren, a year ago, that he was bent upon trying a novel method of coal carbonization, he promised that he would communicate the results of the experiment, whether good or bad. This is the principle that should govern all such tests. Great mischief is wrought by the trick of permitting things to die away quietly when they are not all that might be desired, to which disappointed inventors are naturally prone. One often hears that great results are expected from this or that process, the experimental adoption of which is heralded by a great flourish from interested parties; but in too many instances time passes without anything more being heard of it, with the exception of a vague whisper that it has not gone off quite satisfactorily. This is altogether wrong. So long as a process or a system remains in the hands of its originator, it is nobody's business but his whether it is good or worthless. He can keep his own counsel about it, and nobody will be guilty of the great impertinence of prying into his results. When, however, an invention has arrived at the stage of being able to run alone, and it is put out in order that the fact may be demonstrated, everybody is interested in knowing how it goes; and if it fails, in perceiving the reason. For failure sometimes teaches a most instructive lesson. Wherefore it is to be held that, unless there is some special reason for secrecy, among the conditions imposed by an engineer of a gas undertaking upon the promoters of novel processes submitted to him for trial, there should be the reservation to that official of absolute discretion with regard to the publication of the results. Experimental work is very troublesome, and many gas managers shun it for more or less weighty reasons; but those who, on fit occasion, undertake this addition to their ordinary responsibilities, owe it to the public, to their employers, and to themselves to allow no false sense of tenderness to a disappointed inventor to stand in the way of their telling the truth of their experiences when these contain the actuality or the germ of instruction.

The Gaslight and Coke Company's Assessment Appeals.

THE assessment appeals of The Gaslight and Coke Company have been again before the London County Magistrates sitting at Clerkenwell—Sir Peter Edlin, Q.C., in the chair—and some further progress has been made. The case for the appellants has been completed, and that of the respondents opened; and the whole matter now stands adjourned to the 5th prox. This piecemeal way of hearing the case is necessitated by the numerous engagements of the Court, which is usually so overcrowded with work that when anything extra, like this quinquennial assessment business, comes as an "overtime" engagement for the Bench, there is very great difficulty in dovetailing it in between the ordinary sittings. The relief which the Court may be supposed to have enjoyed in the removal of its licensing responsibilities to the County Council has apparently been neutralized by the growth of the criminal business consequent upon the expansion of the Metropolis, and the concentration upon this particular Court of work that was formerly shared between the Middlesex and Surrey Magistrates. Whatever the cause, however, the fact remains that the repeated adjournments of these appeals make it rather tedious to follow the arguments on both sides. Of course, it is easy to say that the assessment of The Gaslight and Coke Company offers no more difficulty than that of another gas undertaking; but, to judge from the array of wigs in the Court when the case is being heard, and which are supported by an even more numerous lay contingent, the very gravest constitutional matters might be involved. The exceptional magnitude of the Company's trading operations lends piquancy to the powerful imaginary flights of the experts engaged upon both sides, and makes the attributes of that interesting legal fiction, the "hypothetical tenant," more difficult to reconcile with the desires of the different parties to his supposititious trading operations. The evidence adduced in the case is of a most instructive character for students of this variety of gas engineering practice. Without prejudging the issue, we may express the opinion that the case for the appellants has been well and strongly put before the Court; and it will be interesting to see how it is to be met by the other side. It is a good thing that the ratepayers and gas consumers, who have to pay for it all, cannot take a view of the Court, and form an idea of the

cost per minute of these remarkable proceedings. Somehow, the whole thing does not seem to redound to our credit as a sensible, matter-of-fact people.

A Glimmering of Reason.

THERE are indications that a better sense of the bearings of Trades Unionism upon the general question of the welfare of wage-earners is dawning upon the minds of independent observers of industrial disputes, who have been hitherto a little too willing to take self-appointed "leaders" like Mann and Tillet at their own valuation as the only reliable exponents of the wants and views of the working man. It would doubtless "suit the book" of these demagogues to be recognized by everybody as Great Panjandrums of the working classes; but their desire is not likely to be gratified, and it would not be very surprising if before long there should be a wholesale re-distribution of parts among the London Company of Mass-Meeting Orators. For some time past there has been a brisk competition among the London evening newspapers which make a speciality of dispensing blood-curdling reports and sporting tips at the modest charge of "a halfpenny a time," for the patronage of the mass of the Metropolitan population. During the last few days, the most popular of these cheap prints—the *Evening News and Post*—came (quite independently of us, of course) to the same conclusion which was expounded in the article last week upon "New Unionism and Old Anarchy"—namely, that "the "blackleg is the key of the position." This is not the way in which we should put it; but the meaning is the same, and the truth is far too important to be affected by forms of expression. Trades Unionism fails, and the "strike "policy" fails, not because the employers do not like either, or even because the "leaders" of the strikers do not understand their miserable business, but because Trades Unionism only commands the adherence of the minority of the workers of the United Kingdom. Nor is it likely to occupy a better position while its generalship is in such incapable hands, and its interests are so muddled with the advocacy of Socialism and half-a-dozen even less respectable "isms." There are very many more labourers outside the ranks of the Trades Societies than are numbered among the supporters of these organizations; and while this is the case, to commit the former to such a trial of strength as a general strike, is as rank folly as leading an army upon a campaign before securing a safe base of operations. Moreover, there is an awakening of perception that Trades Unions are, after all, only a means to an end, and are not competent to serve as an end in themselves. This view induces those who take it to weigh every offer promising to benefit the workman, whether it comes from the employer or from any other quarter, and to question the credentials and motives of those who would pretend that nothing is good which comes without the *imprimatur* of the men who live by agitation. These things find their level in due course; but one cannot help pitying the victims who are crushed in the levelling process.

Mr. Walter Hole, who, for more than seven years has been assistant to the late Mr. Charles Bird, has been appointed to the post of District Superintendent by the Directors of the Rochester, Chatham, and Strood Gaslight Company.

The Assistant Gas Managership at Huddersfield.—The appointment of Mr. W. R. Herring, of Hastings, as Assistant Manager of the Huddersfield Corporation Gas-Works, at £300 per annum, was confirmed at the meeting of the Council last week.

Further Change in the Staff of The Gaslight and Coke Company.—We understand that Mr. John Methven has been appointed to the engineership of Beckton, over which station he will have supreme control while retaining the management of the Nine Elms works.

The Salford Gas Case.—At the Central Criminal Court yesterday week, Mr. Bowen Rowlands, Q.C., on behalf of the defence, applied to the Recorder to fix a date for the hearing of the case of the *Queen v. Kershaw;* and he suggested that, as it would be convenient to all concerned, the trial should take place to-day (Tuesday). The Recorder assented to this arrangement.

The Estimation of Volatile Matter in Potable Water.—At the first ordinary meeting of the London Section of the Society of Chemical Industry for the ensuing session, which will take place at Burlington House next Monday evening, Mr. W. C. Young, Consulting Chemist to the Lea Conservancy Board, will read a paper on "Volatile Organic Matter in Potable Water, and a Simple Method of Estimating Fixed and Volatile Organic Matter in Water," in the course of which some novel and interesting points will, we understand, be brought forward.

WATER AND SANITARY AFFAIRS.

THE County Council has made a further effort to obtain a reply from Lord Salisbury respecting the proposal put forth by that body last December for a Government inquiry into certain questions affecting the London Water Supply. The Council is also trying to arrange plans with the Corporation of the City, and the County Councils of the Home Counties. Something need be done if there is to be any decisive movement regarding this matter. The Government and the House of Commons have tried what a Select Committee can do; and the result has been a simple *fiasco*. *The Times* can only advise that people shall bridle their tongues, and not quarrel over the matter. At the same time, the columns of the leading journal bristle with controversy on the subject; two influential members of the County Council—Sir T. Farrer and Mr. Beachcroft—appearing in distinct opposition to each other. The intimation given by Mr. Rose-Innes, that the Corporation were determined to bring on a crisis, now takes the shape of a rumour that the Government shall be asked to sanction a scheme for the appointment, by the Lord Chancellor, of some kind of tribunal, before which the Corporation and the County Council may make an appearance. Perhaps we may see a Royal Commission, with power to investigate the national bearing of the water supply question. It seems scarcely fitting for the Government to remain quiescent in the midst of all the agitation going forward on the subject, and after the failure of every effort made by lesser powers to grapple with the business. An authoritative declaration that matters had better remain substantially as they are, would be a decided relief from the present turmoil. There is the prospect of amalgamation being insisted upon, with some further guarantees in the interest of the public. This would be a practical step, not necessarily barring the way to a transfer of the water supply at some future time. The Government may be supposed to feel that something ought to be done; and a moderate measure might commend itself to approval, as involving no risk to the Cabinet like the sweeping proposals brought forward in 1880. The County Council is certainly not commending itself to the confidence of the people of London, and is very far from winning the smile of the Government. On the contrary, the Council seems to be floundering into a deeper bog every week. What change may be effected by the elections in March is a matter of doubt; but some apprehension is entertained out of doors that the coming Council will be even wilder and more impracticable than the one which now exists. London is not lucky in its local government, and its inhabitants are possibly arriving at the conclusion that it is a fortunate thing the water supply is in the hands of the Companies, rather than in the possession of the Council.

A monopoly in the supply of water has been made the subject of considerable criticism; but a more momentous question has reference to a monopoly of the source. If some people could have their way, it is difficult to discern how London would ever get any water at all to drink. The Thames is not to be disturbed; the Lea is to have its full volume; and the growth of watercress is to be held sacred. The valley of the Colne is now the subject of hot dispute; and "speculative engineers" are warned by Dr. John Evans to keep at a distance, as the people of the valley want all the water for themselves. From what we know of the valley, we should think its inhabitants would occasionally be glad if somebody would relieve them of a portion of the supply. It is possible that Mr. George Webster goes a little too far, when he proposes to sell 20 million gallons a day to the London Water Companies. Yet even this perhaps might be spared, if compensation water were provided to feed the Colne; care being also taken to give the inhabitants a proper supply for their general use. Mr. De Rance says, in regard to the streams in the valley of the Colne, that "no compensation would "be adequate even if it were forthcoming." This is saying a good deal; and we can hardly believe that Mr. De Rance means so much as he says. "A Hertfordshire "Man," writing in *The Times*, has a particular horror "of speculative Websters;" and he further complains that his county is threatened with a water famine, owing to the operations of the New River and East London Companies. If London is going to drink up all the water round about, this may be; but the alarmist tone assumed

on this subject suggests exaggeration, and a disregard of reasonable remedies.

It is quite likely, as we have previously intimated, that the London Water Supply will ultimately form part of a much more extended inquiry. We may truly say that there is a great and growing demand for water in the present day; and, as a result, certain questions of right have to be settled which formerly were quiescent. In the appropriation of water as a source of supply, local wants have the prior claim; yet it does not follow that they should take all. If not a drop is to go out of the district, then the very course of the rivers should be stopped. The people of the Colne Valley are content to see the water of their river run away into the Thames; and Mr. De Rance would have it so. Yet, so far as the locality is concerned, the runaway water might as well flow into the mains of the Grand Junction Company. If the Colne is to be kept up for the sake of supplying the Thames, it becomes a matter for consideration whether there is not some better way of feeding the open stream. Unfortunately, just now the problem of the Colne Valley is complicated by the circumstance that a local landowner has tapped the underground waters, and proposes to sell to the London Water Companies the water which he has thus demonstrated to exist. Having bored sundry deep wells, Mr. Webster asserts a private right to sell all he can fetch up from beneath; employing steam power and centrifugal pumps for the purpose. To this diversion of the local resources, many objections are urged. But there is obviously an essential difference between an individual appropriating a volume of water for his own personal profit, and a water company sinking wells in order to fulfil their statutory obligations to the public. If the chalk strata round London are to remain inviolate, although charged with a bulk of water capable of rendering immense service to the Metropolis and its suburbs, there is no apparent alternative but going to Wales, or Devonshire, or Cumberland, or some other remote region, for the purpose of keeping up the requisite supply for London. What this means, we indicated last week, in referring to the cost of the Birmingham project, by which that city is to obtain a supply from Mid-Wales. All that London wants is a supplemental supply, and not even that at present. Unless good judgment is exercised, the people of London may find themselves saddled with an enormous pecuniary burden, for which there will be no adequate justification.

The London County Council and the Laying of Gas and Water Pipes in Subways.—The Parliamentary Agent of the London County Council has been instructed to prepare a Bill giving them power to require that, where there are subways in any thoroughfare, gas, water, electric light, and other companies shall lay their pipes, wires, &c., in such subways, and shall pay the Council a rent for using them.

Accident to Mr. T. Duxbury.—Last Friday, as the Darwen Fire Brigade were preparing to leave the station to answer a "call," Mr. T. Duxbury, Manager of the Corporation Gas-Works, met with an accident. He was standing near the head of one of the horses, instructing the man in charge what to do, when the animal swerved round, and kicked him in the stomach with its hind legs, knocking him to the ground.

Lass's Analysis of the London Water Companies' Accounts.—Our readers will see, by an announcement appearing in another part of the JOURNAL, that the analysis of the Metropolitan Water Companies' accounts which is prepared annually by Mr. Alfred Lass, F.C.A., has been published. The present issue (which is the eleventh) deals with the accounts for the year ending Dec. 31, 1890, or March 31, 1891, according as the Companies make up their books to one or the other of these dates; and they are analyzed in the exhaustive manner characteristic of the work. The tables show that a total capital of £15,157,099 was employed in the supply of water to the Metropolis in the period dealt with; being at the rate of £234 5s. 5d. per million, and 4s. 8·22d. per 1000 gallons. The total quantity sent out for domestic and other purposes was close upon 64,007 million gallons, which was consumed by a population estimated at 5,696,266 at the close of last year; the average daily supply per head being 30·97 gallons. Out of the 769,122 houses served with water on Dec. 31 last, 473,890 were on the constant system. This is an increase of 24,862 as compared with the number at the corresponding date of the preceding year; the additional houses supplied being 10,537. The various items of capital, income, expenditure, profits, dividends, &c., are worked out at per million and per thousand gallons of water supplied. The tables are followed, as usual, by the Companies' rates of supply, their statutory powers as to dividends, and the two most recent Acts affecting them. The addresses of the Companies and the names of the Secretaries are now appended.

ESSAYS, COMMENTARIES, AND REVIEWS.

GAS AND WATER COMPANIES IN THE STOCK MARKET.

(For Stock and Share List, see p. 763.)

BUSINESS on the Stock Exchange during the past week has been, on the whole, dull and quiet. Some markets have shown ephemeral vitality, chiefly through the influence of Foreign Bourses; but in result the changes of price are slight throughout. The Money Market continues in the same easy condition; and so far as one can see ahead, there is nothing in view to indicate the approach of a harder rate just yet. In the Gas market there was played the second act of the melodrama which commenced the week before. It will be remembered that Gaslight "A" on that Saturday was at 206; but there were signs, as we thought, of immediate recovery. This was so much the case that on Monday the stock opened at 212, and closed with the mark of 218; while on the following morning the opening bargain was actually done at 222—that is to say, at 16 better than what it had been done at the previous Saturday. What more is needed to show the utter artificiality of the whole scare? With what degree of success it has been worked, and how much plunder has been gathered as the outcome of it, is more than we can say; but the trick will always command a certain amount of success. *Populus vult decipi;* people like being "diddled." During the rest of the week, a great many transactions took place at prices varying from 218 to 222½; the ultimate quotation showing a rise of 10½ for the week. The secured and the limited issues were also freely dealt in at good steady figures. Extensive transactions were also marked in South Metropolitan "B" at about average figures; the closing mark being the best of the week. A couple of bargains in the old stock, at fairly middle prices, were all that was done in Commercials. There is no change in the quotations of the Suburban and Provincial Companies; and very little business was done in them. Among the Foreign undertakings, Imperial Continental was most active, and recovered 2; the opening and the closing marks being 222. Continental Union, however, receded 5. South Americans were weaker; Buenos Ayres and San Paulo losing ½ each. Among the rest, the only variation was a rise of 1 in Australian. Water was dull and quiet; quotations for the most part showing a slight fall.

The daily operations were: The market was very brisk on Monday; attention being almost riveted on Gaslight "A" and Imperial Continental, which rose freely. The former gained 5; and the latter, 2. One bargain at a low figure was done in South Metropolitan "A." Buenos Ayres fell ½. East London Water fell 1. Tuesday was almost as active. Gaslight "A" rose 4½; but St. Paulo was ½ lower. On Wednesday a lot of business was done in all sorts of Gaslights, especially "A," at good steady figures all round; and other heavy issues were dealt in at good middle prices. The only move was a rise of 1 in Australian. In Water, Lambeth 7½ per cent. rose 2. Thursday was a quieter day; and prices showed no disposition to vary either way. Water was weaker—Grand Junction receding 2; and Lambeth, 1. Prices were, on the whole, rather better on Friday; and Gaslight "A" rose 1 more. Continental Union, however, was 5 lower. Saturday was quiet; but prices remained firm and steady. Water had a further fall—East London and Grand Junction losing 1½ each; and West Middlesex, 1.

ELECTRIC LIGHTING MEMORANDA.

The Sydenham Electric Lighting Company—A False Comparison—The Multiphase System—A Quarrel about Units.

SOME little notice has been taken in the newspapers of the commencement of an electric lighting undertaking for Sydenham and the Crystal Palace district upon a system planned by Messrs. J. E. H. Gordon and Co., who also "engineer" the Metropolitan Company. There has been a regular "function" of foundation-stone laying in connection with this venture, at which glowing prophecies of the usual kind were uttered by the patrons of the Company; and it is understood that the concern will start with plant big enough to supply 20,000 eight-candle lamps, if subscriptions to this amount can only be had. The system of supply will be the continuous current, of moderately high voltage, connected with subsidiary stations for supplying a low-voltage current to the subscribers' houses; and the service will be automatically regulated by compensating storeage batteries. Five steam-engines of 160-horse power, and the requisite number of Parker dynamos, will be laid down at once. The price of current to private consumers will be 8d. per unit, which will not frighten the Crystal Palace District Gas Company, who are thoroughly well known in the place for supplying the cheapest gas of any London Suburban Company. Underground wires will, of course, be used for the distribution; and when the installation gets to work, there will be another interesting experiment to watch. The problem before the Sydenham Company is precisely the same that the Kensington and Notting Hill Companies, with more compact districts, find so puzzling,—namely how to make a profit out of electricity at 8d. per unit, in face of gas selling at an equivalent price of about one-third.

According to their own showing, the electricians ought to be quite happy and contented in Madrid, where they make out that electric light is considerably cheaper than either gas

or petroleum at local prices. Our contemporary, the *Electrical Review*, naturally pounced upon this piece of news, which is given in the form of an article in a Spanish magazine, and published it very prominently in a recent issue. Of course, it is impossible to say that there may not be places where local conditions favour the cost of electric lighting in preference to that of gas or illuminating oil; but we were hardly prepared to find Madrid, where there is no water power, and where boiler fuel is very dear, included in this category. Examination of the data so gleefully reproduced by our contemporary justify our suspicion of the existence of some mistake or misrepresentation on the part of the Spanish magazine writer, for we observe that while he gives the cost of petroleum in Madrid and in London at 5d. and 1d. per pint respectively, and of gas at 9s. 4d. and 2s. 9d. per 1000 cubic feet in the two capitals, he argues that while the cost of a petroleum lamp in Madrid would be 4s. 3d. per month, that of the electric light, *based on the same rate as that charged in London*, would be 3s. for the same period. But is electricity sold in Madrid at the London rate, which, by the way, is erroneously taken to be 7d. per unit? It does not so appear. We suspect that it costs more like 1s. 6d. per unit; and then what becomes of the comparison? What is the use of showing that at 7d. per unit electricity costs less in London than petroleum lighting in Madrid? Really, these electricians are hardly put to it for new arguments.

One of the notable novelties brought into prominence at the Frankfort Electrical Exhibition is the "multiphase" current. As to what this term means, we are not quite so clear as we could wish; but the shortcoming does not greatly oppress us, since it is admitted by our electrical contemporaries. So far as we can gather any sense from the published discussions of the matter, the "multiphase" is a variety of alternating current which is expected to enable this type of current to be stored, and to be used for working motors, in both which respects it differs from the continuous current. The Editor of the *Electrician* is doubtful whether, after all, there is anything in the idea, which he somewhat contemptuously describes as having been born of wonderfully tangled diagrams and of strange formulæ. A specialist writes to *Industries* also to declare that he has reluctantly come to a similar conclusion—not as to the origin of the multiphase current, but as to its practical worthlessness. He admits that the problem of electrical distribution has not been advanced by this device. Another even more practical gentleman impatiently asks whether the multiphase current will prove instrumental in increasing the number of consumers per mile of distributing main; "because this," he dolefully says, "is what we most sorely need." This "bitter cry" of the electrician sums up a good deal of technical literature. It means, as we long ago admitted in these columns, that, so far as *technique* is concerned, electric lighting is perfect enough for business purposes. There might be a little copper saved here and there, and the expense of generating the unit might be reduced a trifle; but nothing of this sort really affects the commercial question. It is the trade that is lacking; and until they can feel themselves in a sounder position in regard to public favour, the most hard-headed and hard-working of electric lighting engineers are apt to look on the production of "tangled diagrams and strange formulæ" as being very much beside the question.

There are "wigs on the green" in the little world of electrical engineering; and the professors and the engineers are squabbling again over their old difficulty—the irreconcilability between electrical and engineering units of energy. Professor Perry is both electrician and engineer; but he has gone over bodily to the side of the professors, and roundly abuses engineers for talking about horse powers and British thermal units, when they might, if they chose, use the far more beautiful and satisfying C. G. S. system, which is decimal, logical, and altogether lovely. On the other hand, the engineers point out that the C. G. S. system ought to have been invented in Lilliput; and that it is ridiculously diminutive for application to industrial requirements, for which the horse power as defined by Watt is a unit quite small enough. Professor Perry has, so to speak, cast off the engineers as unworthy of association with electricians; bidding them continue to use their irrational "foot-pounds," their arbitrary "horse power," and their absurd notation generally, while he and his more elevated associates cultivate the C. G. S. system in the empyrean where they dwell. On the other hand, the engineers declare that electricians do not constitute the whole world; and that, if the latter prefer to talk of microscopical units, there are plenty of other people with work to do who are far from despising the pound weight and the foot rule. It is "a very pretty quarrel as it stands;" and we heartily wish that the best side may win.

Awards by the Institution of Civil Engineers.—Among the awards made by the Institution of Civil Engineers during the past session was a Telford Premium to Mr. Bryan Donkin, jun., M. Inst. C. E., for a paper on "Thermometers in and about the Cylinder Walls of Steam-Engines, with some Experiments on the Temperature of the Metal under Different Conditions;" and a Miller Prize to Mr. Auriol Sealy-Allin, Stud. Inst. C. E., for his description of "A New Type of Water Motor." Mr. Donkin had previously received Telford Premiums for his contributions to the Transactions of the Institution.

WANTED, A CATALOGUE.

THE regrettable failure of the Institution of Gas Engineers to hold the expected autumn meeting, for which it is known that several good papers had been prepared, will be very philosophically borne by the governing authorities of the various permanent scientific and technical societies which are open to receive communications relating to gas supply. It has already been pointed out in the JOURNAL that such organizations as the Society of Arts and the Society of Chemical Industry are likely to profit by the absence of any technical association which could be regarded as representing the British gas industry, and which is accustomed to meet oftener than once a year. In so far as any such beneficial result may be found to touch the Society of Arts, we should not regret this consequence; for we entertain a high opinion of the work of the Society, and of its management. There is no more useful organization of the kind in Europe than the Society which has its head-quarters in the old house in John Street, Adelphi; and this statement may well be endorsed by gas engineers, who have often been led to look for instruction in their own art to the specialists appointed to lecture before the Society. It is not to be supposed that any peripatetic society of specialists could undertake all the work, even for its own branch of art or industry, that a central institution like the Society of Arts can perform. This organization is in touch with the leading technicians of the day; and when there is a desire on the part of the management to take up any particular branch of industrial or artistic study which appears to require encouragement or assistance, the funds are forthcoming for the support of the cause. In this way more attention is given to the treatment of a subject than a moveable society could afford to bestow.

Take, for example, Professor Vivian B. Lewes's Cantor Lectures upon "Gaseous Illuminants," which were arranged for by the Council of the Society, and have been carried by the JOURNAL and other technical publications to the ends of the civilized world. It is safe to say that no Association of Gas Managers could have done the work of the Society of Arts in connection with this course of lectures. The mass of matter dealt with by the lecturer was too great to be contained in any single communication; and there is absolutely no provision by any gas engineering society for the publication of any other technical matter than may be compressed into a paper which might be read (say) in an hour at most. True, papers are occasionally taken as read, and are published in Transactions; but this is a very obscure kind of publication. Thus, if it had not been for the enlightened action of the Council of the Society of Arts, not only would the world of gas engineering be the poorer for the lack of the course of Cantor Lectures on "Gaseous Illuminants," but we should not have had Frederick Barff's seven lectures on the "Carbon Compounds," nor Vernon Harcourt's four lectures on the "Chemistry of Gas Manufacture," nor Field's six lectures on "Solid and Liquid Illuminants," nor Harold B. Dixon's three lectures on the "Use of Coal Gas"—to say nothing of many other instructive lectures and papers bearing more or less on the general subject of lighting. Therefore we are justified in maintaining that the Society of Arts has a field of its own, in the wide domain of higher technical instruction, which no mere specialists' organization can occupy.

It may be argued, however, that neither a central Society for the Encouragement of Arts, Manufactures, and Commerce, nor the different Associations identified with particular industries, such as that of gas supply, cover all the ground that awaits the technical instructor. The encouragement of an art or an industry, for example, may be supposed to embrace other services than arranging for lectures by specialists upon points of its chemistry, physics, or mechanical equipment. The nearest French counterpart of our Society of Arts is the Société d'Encouragement pour l'Industrie Nationale, which was founded in 1801, and is, we believe, a subsidized organization under the control of the Ministry of the Interior. This Society is managed by a Committee, who appoint experts to examine and report upon inventions and manufacturing processes giving *primâ facie* evidence of utility, and also receive and reward publications of interest and importance relating to industrial subjects. The Society of Arts conducts trials of machines—as gas-engines, for example; but it rarely goes so far out of the beaten track of lectures and papers. We think the Council of the Society might do a little more in this direction, with advantage both to the community and to the Society itself. It is difficult to lay down a general requirement with regard to such a subject; and the question of expense must always govern the expansion of a technical society in the direction indicated. But, with all due regard to circumstances, we still incline to the opinion that the Society of Arts would do well to go a little more freely into comparative tests of systems, processes, and appliances used in the arts and in the dwellings of the people, with special regard to such things as are not wholly subservient to economical influences.

It may be objected that jurors' reports upon exhibits at shows are not always worth the trouble and cost of getting them; but the investigations that we have in mind at present are not concerned with commodities as to which the verdict of the market must be conclusive. We do not ask the Society of Arts to decide whose cocoa or mustard is the best, but to interest itself, and through itself the community, in such matters as house

ventilation, the economy of household labour, the development of the illuminating power of gas, the problem of the smokeless combustion of coal, and so forth. There is no money in many of these problems; and therefore they are neglected by the ingenious people whose one test of the value of an invention is that there shall be something about it to sell over the counter. Commercial enterprise is a good thing, and does wonders in ameliorating the lot of the people in many ways. But where there is nothing to sell, it naturally fails; and this is just the point where the care of the Society of Arts ought to begin.

There is another point, however, which has already been touched upon, where existing agencies for spreading technical instruction fall short. It is in the matter of placing upon record from time to time the exact position of an industry. We happen to have received lately a copy of a memoir presented to the Société d'Encouragement by M. Auguste Lévy, Engineer of the Paris Gas Company, entitled "The Actual Situation of Gas, from the Point of View of Lighting, of Ventilation, and of Photometry;" and the reflection immediately occurred to us that there is nothing of this kind ever done in England. M. Lévy has produced, with reference to the industrial latitude and longitude of Paris, a clear, exact, and comprehensive statement of the actual methods and appliances used to adapt gas for the purposes named. His memorandum is a *résumé* of the whole subject; showing in all necessary detail the character of the Parisian gas consumer's resources in 1891. The nearest approach to a statement of the same kind for English gas consumers is the Report upon the Gas Section of the International Electric and Gas Exhibition of 1882-3, which is now in a considerable measure obsolete. The usefulness of such a periodical stock-taking of an industry as that which M. Lévy has executed for the French gas interest is too obvious to need explanation; and the materials for it are always at hand in the shape of manufacturers' catalogues and price lists. The question is, Who is to do the work? For book-making of this order does not pay, in the narrow commercial sense. The compiler's expenses would have to be defrayed from some source; and there is no organization capable of undertaking this responsibility. Yet surely it is not necessary that all the outlay and trouble of holding an actual exhibition of gas appliances should be incurred merely for the sake of producing what to many people is the most valuable result of such a collection—the illustrated catalogue and jurors' report.

We believe that a quinquennial report of the gas apparatus in use in the United Kingdom, compiled from contemporary materials, would be a very useful agency for collecting and disseminating information upon the subject of gas supply. It need not be an expensive work; but it would require to be done by competent hands. All sorts of statistics relating to gas supply would find a place in such a return, which would serve as an authoritative guide to the lines of development of the gas industry from one quinquennium to another. A periodical report of this character would, indeed, form a fitting pendant to the work of the Society of Arts and of all the different Gas Engineering Societies. May we suggest that the ever-accumulating balances in the treasuries of these latter organizations might find worse employment than in assisting statistical work of this character?

By way of showing what can be done by an unassisted compiler of a report upon gas apparatus, a synopsis of M. Lévy's memoir may be given. He begins by sketching the progress of the popular demand for gas in Paris, and then goes on to describe the most recently introduced kinds of gas-burners; showing the principles upon which the designers have relied, and commenting upon the degree of success they have attained. It may be remarked that M. Lévy ascribes the invention of the recuperative gas-burner to a Frenchman, Chaussenot, who made a double-chimney Argand in 1836. This lamp obtained a prize of the Société d'Encouragement, whose experts reported that it realized an economy of one-third in the consumption of gas. Curiously enough, M. Lévy observes that "this burner came before the time when better lighting was demanded, and so it was abandoned." But the experts of the Société d'Encouragement said not a word about better lighting; only remarking on the economy of gas. It would appear, therefore, that M. Lévy is not quite logical in what he says about the reason for the non-success of the Chaussenot burner. It is well known that, whoever was the true inventor of the double-chimney Argand, this arrangement has failed to recommend itself for permanent employment by gas consumers, on account of the effect of the heat upon the inner glass.

Referring to the initiative of Frederick Siemens in resuming the study of heat-recuperation as a means of improving the luminous effect of gas-flames, M. Lévy well says that, although the later lamps of this order are superior in appearance to the wonderful first Siemens lamps with the side chimneys, the luminous duty of these ungainly constructions has not been surpassed. It appears from M. Lévy that the old Schülke lamp is now to be called the Parisian lamp; and he mentions several other patterns of high-power gas-lamps suitable for street lighting, such as the "Industrial," the Guibout-Giroud, the Delmas, the Sée, the Ezmos, the Lebrun-Deselle, and the Danischewski, which are almost, if not entirely, strange to English technology. Among regulators or governors, M. Lévy cites the Bablon, the Giroud, the Parsy-Derval, which are exclusively French patterns. Of course, mention is made of the Wenham, the "Cromartie," and Clamond lamps, and of other gas apparatus known all over the world. M. Lévy gives a good deal of information, moreover, upon the subject of ventilation by gas; and his pamphlet is worth getting, if only for this portion of the contents.* The concluding portion of the memoir is devoted to photometry.

It will thus be seen that, although it does not contain a great deal that an authoritative report upon gas apparatus generally ought to comprise, M. Lévy's memorandum is both an instructive and an interesting production; and we wish it had an English counterpart as good. There would be no difficulty in the production not only of a counterpart, but even of a superior report to that of M. Lévy, if the task were taken in hand by the proper authority, and a little money spent upon the work; for English gas apparatus is as much more varied and comprehensive than French productions of the same character, as gas is more largely used for all purposes in England than it is in France. This would be a measure of technical instruction against which nothing could be advanced; and we should be glad to see the matter taken up in the proper quarter.

BOOKS FOR THE DESK.

Last week there appeared a book for which there has been from time to time much anxious inquiry from the higher orders of gas companies' officers, from members of local authorities and their responsible advisers, and indeed from the whole host of professional men engaged in the promotion of, or in opposition to, Gas Bills in Parliament, and in the transfer of statutory gas undertakings to local authorities. This is the continuation to date of the invaluable "Precedents in Private Bill Legislation affecting Gas and Water Undertakings" published in 1879 by the late Mr. G. W. Stevenson.† It is unnecessary to say anything in commendation of a work which is truly indispensable to all having business in connection with parliamentary dealings with gas and water supply. We believe that the authors have spared no pains to attain perfect accuracy in their tables and abstracts of Private Acts; and it will be found that the arrangement of their matter leaves nothing to be desired with respect to clearness. There should be no room for criticism in a book of this nature; and we cannot find any in the present example. Now that the Private Bill season is coming on, and the final touches are being put to schemes of legislation, while opponents are lying in wait for statutory projects which they know to be undergoing incubation, Messrs. Stevenson and Burstal's book comes in due season to teach both parties the probable course of future legislation by the evidence of the past.

We have received the first volume of the second edition of Lunge's "Treatise on the Manufacture of Sulphuric Acid and Alkali;"‡ and we have no hesitation in recommending anyone who desires complete and trustworthy information upon this and the allied branches of industrial chemistry to procure a copy of the book. The first edition of Dr. Lunge's work has established itself as the one great authority upon the subjects of which it treats; and of course the new edition will be even more sought after, and more frequently quoted in technical writings, than the older one. Twelve years have elapsed between the two editions—a period quite long enough to remove much of the apparatus and even of the science of a progressive industry from the ranks of the new, and relegate it to the scrap-heap of the old-fashioned and the obsolete. In the alkali trade in particular, there have been so many changes during the period in question, that Dr. Lunge has had to practically re-write his "Treatise," and re-arrange its whole scheme in order to bring it up to date. He has been compelled, by pressure of fresh matter, to leave out much retrospective and historical information which found a useful place in the old book; but he has only done so under protest, and has by abundant references to it, made the best provision possible for preventing this kind of information from being overlooked. How necessary it is to have at one's fingers' ends all that has ever been done or thought of in a chemical or manufacturing industry, is only fully appreciated by those whose duty it is to chronicle from time to time so-called "progress" in the arts. So many things are being continually re-invented over and over again, and so much that is advertised as novel is as "old as the hills," that the most modern-minded of observers of what goes on in the world are those who have the most regard for history. Still, as Dr. Lunge says, what students most immediately need is to be posted up with regard to the latest developments of their chosen arts; and so he has sacrificed history to news. The book has been enlarged, illustrated more abundantly, and, indeed, improved in every way. The author says of it himself that it is in point of fact new, and that the first edition has only served as the principal source of information. It is not within our province to criticize what Dr. Lunge has to

* M. Lévy's pamphlet is published by MM. Chamerot et Renouard, 19, Rue des Saints-Pères, Paris.

† "Precedents in Private Bill Legislation affecting Gas and Water Undertakings, 1879-1890." Compiled by E. H. Stevenson, M. Inst. C.E., F. S. I., and E. K. Burstal, M. Inst. C. E., M. Inst. M. E. London: Walter King; 1891.

‡ "A Theoretical and Practical Treatise on the Manufacture of Sulphuric Acid and Alkali; with the Collateral Branches." By G. Lunge, Ph. D. Vol. I. Sulphuric Acid. London: Gurney and Jackson; 1891.

say respecting the manufacture of sulphuric acid. This branch of chemical industry has only an indirect connection with the class of subjects commonly discussed in the JOURNAL; and we shall therefore content ourselves with repeating the assertion that whoever wants to learn all about this manufacture will find his thirst for information satisfied in Dr. Lunge's pages. The author's treatment of his subject is, in short, monumental; and he has blended with his main story a mass of incidental and subsidiary information that cannot fail to prove most useful to chemists, whatever their speciality. Dr. Lunge refers, of course, to the utilization of spent gas oxide in the manufacture of oil of vitriol, and to the occasional conversion to the same purpose of the sulphuretted hydrogen given off in the manufacture of sulphate of ammonia, which, however, he regards as usually an unprofitable process.

COMMUNICATED ARTICLE.

LIGHTING.

By W. H. Y. Webber.

PART I.—THEORY.

(*Continued from p.* 710.)

Although the following contributions to the study of the subject of lighting are, in a sense, theoretical, they all have a practical basis, as having been written with close reference to actual lighting problems.

Writing in 1883, Mr. William Thomson, F.R.S., of the Royal Institution, Manchester, drew public attention to the distribution of light from ordinary street lamps, and recommended the general use of semi-translucent white reflectors in the tops of the lanterns, for better directing the light of the gas upon the roadway and pavement surface. The subject of lighting in its quantitative aspect was left alone for some years more, until in 1884 Mr. W. H. Preece, F.R.S., read a paper before the Royal Society upon a proposed standard of diffused illumination. This important paper was published in full in the JOURNAL at the time.* The author remarked, on the general subject: "We do not want to know so much the intensity of the light emitted by a lamp, as the intensity of illumination of the book we are reading, of the walls upon which we hang our pictures, or of the surface of the streets and of the pavement upon which the busy traffic of streets circulates. Illumination of this character depends not on one source only, but on many sources of light distributed in innumerable ways." Therefore Mr. Preece proposed to measure the illumination of surfaces quite independently of the sources of light by which they are illuminated. He observed that there had been insurmountable difficulties in the way of the comparison of the illumination of surfaces; but he thought the difficulties in question had disappeared with the introduction of the Swan incandescent electric lamp. He proposed as the standard of diffused lighting that given by "the British standard candle at 12·7 inches distance, which is the same as the illumination given by one French standard '*bec*' on the same space at the metre distance."

Mr. Preece remarked, in connection with this proposal, that "the principle of measurement which guides us in nearly all the methods at present in practical use, is to compare two surfaces equally illuminated to the same intensity by lights placed at different distances, and to compare them by the law of inverse squares determined by Kepler. This law, however, assumes a clear space through which the light is transmitted, and the emission of this light from a point. Distance, therefore, becomes essential; and the error introduced by large flames, or by the diffusion of light, becomes difficult to eliminate. Indeed, by the present system it is well-nigh impossible to measure satisfactorily the light-giving power of several lamps distributed over a room or large area. Moreover, the principle ignores the presence of different colours; and it involves the necessity, with electric arc lamps, of taking measurements at different angles. Up to the present time, the simplest and perhaps the most favourite mode of measurement is Rumford's plan of contrasting shadows; but Bouguer's method of comparing equally illuminated surfaces, as carried out by Ritchie and Bunsen, is also in great favour."

Mr. Preece then described the legal standards of light as used in England and France, and referred to various suggestions for superseding them. He went on to observe that for his standard of illumination he required a uniformly lighted surface, and an instrument for producing this result at will. For this purpose he made use of a small Swan incandescent electric lamp giving 2½-candle power for a current of 5 volts. The lamp was fixed inside a cylinder or box, blackened in the interior, and having over one end a stretched diaphragm of drawing-paper with a round grease spot in the middle. At about 12 inches distance from the end of the tube, a screen of white drawing-paper was fixed. The diaphragm was so screened by a sliding cover that no light fell upon it save that reflected from the paper. At the end of the tube where the lamp was fixed there was an eye-piece, through which the illuminated surface of the diaphragm at the end of the tube could be observed. The lamp was fed by a secondary battery, and means were provided for varying the strength of the current.

* See Vol. XLIV., p. 21.

The idea in working this instrument was to fix the screen in the place where the quantity of lighting was to be determined, and then to increase or diminish the current to the lamp until the grease spot, viewed through the eye-piece, became invisible. Then the light reflected from the diaphragm, and transmitted through the grease spot by the distant surface of the drawing-paper, would be equal to the light thrown upon the opposite side of the diaphragm by the lamp. The current producing the light thus became the measure of the illumination of the screen. The instrument was calibrated by comparison with a standard candle, with the result that the illuminating power of the incandescent lamp employed was found to increase in the ratio of the sixth power of the current. Unfortunately, the efficiency of the instrument depended wholly upon the constancy of the lamp and the reliability of the ratio just mentioned. Mr. Preece thought at the time that the incandescent lamp might be regarded as the most constant source of artificial light known; but he has probably seen cause to modify this opinion, for nothing has been heard lately of his diffusion photometer, or of his proposed standard of lighting—the *lux*—which, as he suggested, should be taken as the light given at a distance of 12·7 inches by one standard candle. Although nothing, practically, came of Mr. Preece's suggestion (perhaps owing to the defects of the instrument whereby he sought to carry it out), it is mentioned here on account of the recognition to which it testifies that some definite standard of illumination is desirable.

Since Mr. Preece brought forward his proposition, a decided movement has been made in the direction of the quantitative study of lighting. In connection with the proposed illumination of the grounds of the Chicago Exhibition, a Committee of Electricians reported* that the proper height of the electric arc, and therefore of any other source of artificial lighting, should be 0·7 of the area to be lighted by any one lamp. Professor Henry Robinson, in the course of a paper read before the Incorporated Association of Municipal and County Engineers (see *ante*, p. 20), declared that the height of arc lamps should be so arranged as to give an angle of 7° to the most distant point it is intended to serve, and gave the following rule for determining the coefficient of minimum lighting power in streets: Let P = the candle power of lamps; L = maximum distance from lamp in feet; H = height of lamp in feet; and X = a coefficient. The light falling on a unit area of pavement varies inversely as the square of the distance from the lamp, and is directly proportional to the angle at which it falls. This angle is nearly proportional to the height of the lamp divided by the distance. [It should be the slant distance to be quite correct.] Therefore—

$$X = \frac{P}{L^2} \times \frac{H}{L} \text{ or } X = \frac{PH}{L^3}.$$

Professor Robinson remarks that the usual standard of gas lighting is represented by the amount of light falling on the unit area of pavement 50 feet away from a 12-candle power gas-lamp 9 feet high, which gives a coefficient as follows:

$$X = \frac{12 \times 9}{50^3} = 0{\cdot}000864.$$

He compares the performances of electric arc lamps of various powers with gas lighting after this standard, and also after double the intensity, or a coefficient of 0·001728, which would be the amount of light on a unit area 50 feet away from a 34-candle gas-burner 9 feet above the surface.

Writing in the *Electrical Review*, Mr. Ralph Richards has discussed the question of lighting with special regard to its physiological and optical sides, in a series of articles entitled "Practical Photometrical Research." Mr. Richards thus explains, upon physiological grounds, the well-known "spotty" aspect of areas, such as streets, lighted by sparsely-placed lamps of high illuminating power. He remarks: If the eye be directed towards a large and brilliantly illuminated area, the iris will contract to a certain extent. Let us suppose this area to be a large circular surface. As we observe it, the edge gradually appears to lose brilliancy, while the complementary portion gains in illumination. Colloquially speaking, the light gradually retires from the edge of the circle and accumulates proportionally towards the centre. This disparity continuing, the pupil will gradually contract, until, if the final central illumination is sufficiently powerful, the eyelids will close. It is to be noted that the contraction of the iris is governed by the resultant optical exhaustion. Consequently, if we are observing a large area which is uniformly, though slightly, illuminated at all parts except in one locality where the light is of dazzling brilliance, the iris will be closed in proportion to the resultant action of the illuminated area. Since, however, the disparity is in this case very great, this adjustment or contraction will be approximately correct in regard to the higher, but far too great relatively to the area of lower illumination. Hence, although perhaps sufficiently brilliant, the area appears to be but indifferently illuminated, owing to the great contraction of the pupil due to the more brilliant light. This is precisely what occurs in connection with the use of arc lamps, &c., when the eye encounters not only those rays which are reflected from the illuminated surface, but also those which emanate directly from the radiant matter. If the latter rays are screened off from the eye, the result is a far greater efficiency of lighting due to the immediate dilatation of the pupil, and consequent enhancement of visual power.

* *Vide* JOURNAL, Vol. LVII., p. 444.

Mr. Richards regards the problem of efficient lighting as requiring the satisfaction of two points: (1) Shading the direct rays from reaching the eye; and (2) admitting the greatest possible utilizable percentage thereof. With respect to the quality and disposition of artificial lights for various purposes, Mr. Richards states that for study a bright white light is desirable, which should be arranged, for the sake of economy, as near to the work as possible, while for comfort it should be a back light. He assigns the best position for such light at a distance of about 2 feet above the work; the light being situated in a vertical line from the back of the neck when the head is bent forward as in study. At this distance a light-source of from 15 to 20 candle power is necessary, according to Mr. Richards; and the rest of the apartment should be illuminated, because reading by a bright light in a dark room is, in general, a cause of restlessness. He claims to have determined experimentally, by the aid of the standard candle, the following data for illumination. The requirement is expressed in the table in terms of the distance in feet from the standard candle; and it is emphasized that in all cases shaded lights should be employed. While retaining Mr. Richards's figures, the arrangement of his table has been altered so as to make it present a scale of progressive brilliancy in lighting:—

Table of Lighting.

Style.	Light suitable for	Intensity = 1 Candle at Feet of Distance.
	Street Lighting—	
No. 1.	Road or pavement.	10·0
,, 2.	Walls	8·0
	Church Lighting—	
,, 3.	General light.	4·0
,, 4.	Pew or reading desk	0·5 to 0·3
	Theatre Lighting—	
,, 5.	Auditorium	3·0
	Public Halls—	
,, 6.	General area.	3·0
	Workshop Lighting—	
,, 7.	General light	5·0
,, 8.	Benches	0·3
,, 9.	Optical or fine work	0·2
	Domestic Lighting—	
,, 10.	Corridors, passages, halls, &c. .	2·5
,, 11.	Living-rooms	2·0
,, 12.	Library or study	4·0
,, 12*a*.	Bedroom	4·0
,, 13.	Reading-table	0·5
,, 13*a*.	Dinner-table.	0·5
,, 13*b*.	Dressing-table	0·5

[The numbers marked *a* and *b* have been added.]

Mr. Richards admits that, where a considerable area is to be lighted, much subdivision will be found advantageous; so that an installation consisting of ten 5-candle power lamps properly located, is vastly superior to one of a single lamp equal to the sum of the ten, other things being equal, not only on account of the lesser contraction of the pupil (which exercises an enormous influence upon the resulting efficiency), but also since, by subdividing the light, a more homogeneous illumination is secured, whereas in the latter case the area in the immediate vicinity of the lamp will be extravagantly illuminated, conversely the remoter parts receive but a meagre amount of light-radiation in proportion to the central parts.

(To be continued.)

The Supply of Compressed Air for Motive Power.—The industrious little town of Offenbach, near Frankfort-on-the-Main, has just completed and started an interesting air supply, similar to the much larger enterprise at Paris. This is the first town in Germany, says *Engineering*, where an arrangement of this kind has been inaugurated; and the air is used chiefly for small motive powers. At present there are about 23,000 feet total length of cast-iron main, with 26 valves; and about 5000 feet of 1 foot, 5000 feet of 3-inch, and 13,000 feet of 4-inch pipe. The joints are all made with india-rubber rings. This network of pipes, after being laid in the streets, was tested with the following results: With a pressure of 6¾ atmospheres kept up for 70 hours, the loss per hour was only 1·99 cubic metres, or 0·028 cubic metre per hour per kilometre. The pumping-station contains steam compressors, boilers, air reservoirs, &c. The air compressor is kept to six atmospheres. The steam-engine is of the compound horizontal side-by-side type. It is condensing, and has two cranks with fly-wheel between them. The steam expands, as usual, in two cylinders; but the novel feature is that the air is compressed in two other cylinders, which are placed tandem, one after each steam cylinder. The first compresses air up to two atmospheres; and the second completes the pressure up to six atmospheres. A special arrangement cools the air in the cylinder, and in the receiver between them, by means of water-jets. The efficiency of the whole machine is estimated at 87 per cent. The steam cylinders are about 22 and 32 inches in diameter by 3·28 feet stroke; while the air cylinders are about 16 and 24 inches in diameter and have the same stroke, as each air piston is worked direct by rods from the back of the corresponding steam piston. The engine is said to consume 15½ lbs. of steam per indicated horse power per hour. The most remarkable feature is the high speed attained by the air-pumps—viz., 75 revolutions per minute, or equal to 490 feet per minute.

TECHNICAL RECORD.

MIDLAND ASSOCIATION OF GAS MANAGERS.

A General Meeting of this Association was held at Birmingham last Thursday. On the members assembling at the Great Western Hotel shortly after mid-day, it was intimated that, consequent upon a local engagement, the President (Mr. C. S. Ellery, of Bath) was unable to be present; and Mr. R. O. Paterson, of Cheltenham, a Past-President of the Association, was voted to the chair.

The notice of meeting having been read by the Honorary Secretary (Mr. J. S. Reeves, of Bilston), three new members were elected: Mr. R. Jones, of Dawley, Mr. E. Layton, of Sutton-in-Coldfield, and Mr. W. Murray, of Uttoxeter.

The next item on the *agenda* was the election of officers for the ensuing year. Mr. W. Littlewood, of West Bromwich, was chosen President. Mr. C. Meiklejohn was appointed Honorary Secretary, in place of Mr. Reeves, who had renewed the request made the previous year to be relieved of the duty of this office. Mr. Peter Simpson, of Rugby, was retained in his office of Treasurer. Mr. Reeves was placed on the Committee, together with Messrs. J. S. Cranmer and V. Hughes—in place of the three members retiring by rotation. The Auditors appointed were Messrs. Hulse, of Longton, and Belton, of Wellington, Salop. Votes of thanks were next awarded by acclamation for the services rendered by the officers of the Association who retired at this meeting; and a vote of condolence with the relatives of Mr. Josiah Deakes, of Worcester, was passed, on the suggestion of Mr. Paterson.

Mr. H. Hack, of Saltley, then read a lengthy paper (see next page) on "Elliott's System of Continuous Carbonizing;" and great interest was evinced in it and the series of drawings exhibited in the room in connection with it. Time did not allow of any discussion taking place on the paper; but as it was regarded by certain of the members as somewhat unfortunate that it should go forth—condemnatory of the process, as it was—without some explanation of the possible reasons for the failure of the plant in Mr. Hack's hands, it was agreed to appoint a small Investigation Committee to visit Ludlow and inspect and report upon the system before the discussion of the paper is taken up at next February's meeting of the Association.

The members then visited the Birmingham Oxygen Company's works at Saltley, where they were received by Mr. Kenneth Murray and Mr. Andrew Stephenson, as representing the Brin Oxygen Company, and by Mr. T. E. Priestman on behalf of Messrs. R. and J. Dempster, whose work in connection with a three-lift columnless gasholder on the Gadd and Mason principle attracted considerable attention as part of the oxygen plant.

The oxygen apparatus is capable of making 10,000 cubic feet per day. The producer contains 24 cast-iron retorts of 6½ inches internal, and 8 inches external diameter, set vertically in two bays on either side of a carbonic oxide generator, which supplies the necessary gas for heating the retorts. The quantity of barium oxide contained in the retorts is about 1¼ tons; and the life of the barium in a furnace constantly at work is reckoned at three years. The maximum quality of oxygen obtainable from the furnace which was at work is 97 per cent., and the quality in the holder 94 per cent. The plant is entirely automatic in operation; and the principle of working is the same as that which has been already described in the JOURNAL. The object of the oxygen factory in Birmingham is to supply oxygen in a compressed state in cylinders for lantern work, medical, brazing, and other purposes. The compressors for filling the cylinders from the holder are of the ordinary three-staging type, and they compress the oxygen into various sizes of cylinders to a pressure of 120 atmospheres, at which the bulk of gas contained in each cylinder is known, and a measured quantity is in this way delivered to the various consumers. Before being charged, the cylinders are tested under hydraulic power to a pressure of 2 tons on the square inch; and this test is periodically repeated, so as to ensure safety in the delivery and conveyance of gas at this high pressure throughout the country. The Birmingham Oxygen Company also supply compressed coal gas in the same way; and to preclude the possibility of either gas being inadvertently charged into the wrong cylinders, they have adopted what is now almost a universal rule of painting all their hydrogen cylinders red, and having all the valves and their connections on the left-hand side.

The inner lift of the Gadd and Mason holder used for storing the oxygen as made, is 38 feet in diameter and 18 ft. 2 in. deep; the outer lift, 40 feet in diameter and 18 feet deep. The steel tank is 42 feet in diameter and 18 ft. 9 in. deep. The bottom of the tank is level with the ground; and when the holder is fully inflated, the height from the ground to the crown is 54 feet—thus fully exposing the holder to the wind. There are six spiral guides at an angle of 45° for each lift, with the guide-rollers and carriages for each guide. The holder has, we learn, worked without a mishap or hitch of any kind since it was finished. The first time it was inflated with air it went up without any difficulty; and it has never been necessary to touch or alter it in any way since.

The members, on their return to Birmingham, dined together at the Great Western Hotel.

ELLIOTT'S PROCESS OF CONTINUOUS CARBONIZING.

A Paper read by Mr. H. Hack, M. Inst. C. E., of Saltley, before the Midland Association of Gas Managers, Thursday, Oct. 22.

It will be remembered that when the members of this Association visited the Swan Village Gas-Works, on the 13th of November last, to inspect the Elliott process of continuous carbonizing as in operation there, the author was unable to afford any definite information respecting it, but stated that, whether the experiment proved successful or otherwise, the results should be communicated to you; and he has now the pleasure of fulfilling that promise.

In July, 1888, the author paid a visit to the Ludlow Gas-Works to see the system at work as applied to a setting of three single retorts, 10 feet long, as described in the JOURNAL OF GAS LIGHTING for Nov. 5, 1889. Although from these retorts being worked in conjunction with others, Mr. Elliott was unable to give any statistics by which the results could be compared with those obtained from the ordinary settings, charged and drawn in the usual way, yet, judging from the apparent ease with which the operations were effected, the satisfactory condition of the coke as it fell from the cylinders (of good size, thoroughly carbonized, and requiring no quenching), and the generally favourable account given of the process by Mr. Elliott, the author felt justified in recommending his Committee to sanction a trial upon a slightly extended scale, in conjunction with the experimental plant at the Swan Village Gas-Works, in which the yield of gas and residuals could be accurately determined—the only satisfactory way of arriving at a just conclusion of any proposed new method of carbonizing.

Messrs. Cockey and Sons, of Frome, having made the ironwork for the Ludlow setting, the author deemed it prudent to entrust that portion of the work to them, with the view of reaping the benefit of any improvement which the experience at Ludlow might indicate as desirable; and the patentee was instructed to confer with that firm, so that the details might be arranged in accordance with his views, and to suit the conditions of the old beds or archways in which, to save expense, the installation was to be made. The dimensions and form of these would not admit of the *best* arrangement that could be designed for a trial of the system. Greater height and width would have been preferable; but the author deemed that, without building new arches, the value or otherwise of the principle could be tested.

The drawings on the wall show the settings and the general arrangement of the gearing, coal-hopper, gas ascension-pipes, and feed-pipes. [The general arrangement only is reproduced. The system has already been described and illustrated in the JOURNAL—see July 16, 1889, p. 127; Nov. 5, 1889, p. 876; Feb. 11, 1890, p. 240.]

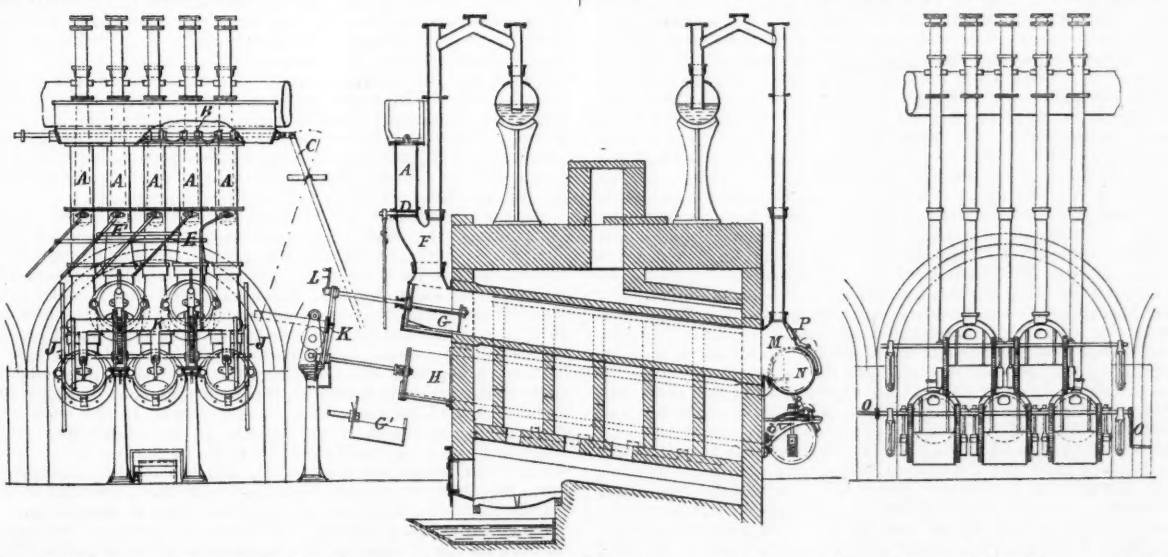
The members will recollect that there were two settings, each of five single retorts, 18 inches in diameter at the front or charging end, and 20 inches at the discharging side; the length over all on the horizontal being 10 feet, and 11 ft. 6 in. on the slope, the fall of the bottom of the retort from the front to the back being 20 inches, making an angle of 8° with the horizontal. The increase in the diameter of the retort at the coke cylinder end is given, as will be readily understood, to prevent wedging of the coke; and so, apart from the slope, afford additional facility in the operation of discharging.

A Körting steam-jet exhauster was employed, the dip-pipes being sealed 2¼ inches, and an exhaust of from 18-10ths to 20-10ths maintained in the hydraulic main—the pressure on the retorts, as shown by the gauge, averaging about 4-10ths. The condensing-main, scrubbers, purifiers, and purifying medium being the same as used in connection with experiments upon the same kind of coal distilled in the ordinary retorts in the usual way, for a comparison of results it is unnecessary to describe them in detail.

The author had ascension-pipes and a hydraulic main provided at *both* ends of the settings, so that, in the event of the system proving in other respects a success, a comparison of the results might be made with the gas taken off alternately from either end of the retort, and principally with the idea of ascertaining, on a practical scale in each case, the effect upon the composition and quality of the gas—in the one case the gas from the new (hourly) charge having to pass over coke of a gradually increasing temperature; in the other, just the reverse of these conditions obtaining. Our Continental brethren have frequently asserted to the author that our through retorts, worked with a hydraulic seal, were the chief cause of the trouble with stopped pipes, and the deterioration in the quality of the gas produced; their idea being that, despite all care in adjusting the level of the hydraulic main and the dips to a uniform seal, in course of time variations in the level and contents of the hydraulic main will cause a difference between one side and the other in the resistance offered to the gas, when, however slight this difference may be, the tendency of the gas must be to escape up the pipe where there is the least resistance to be overcome, in which case it passes over (assuming a 20-feet retort) 10 feet average length of heated surface, as compared with 5 feet if each pipe took its due share—the effect being to decompose the gas, the volatile constituents passing off to the main, causing carbon to deposit itself in the pipes on its way there. The author firmly believes in this theory, and would advocate single retorts set end to end, or long retorts blocked in the middle, were it not for the difficulty of removing the rapid accumulation of carbon that takes place at the back end of the retort, and the hindrance to a satisfactory application of machinery for charging and drawing such retorts; for, when newly set, for such as West's machinery, a slight clearance space must be left between the end of the scoop and the end of the retort, while, to allow for a carbon deposit, the scoop must be made still shorter, causing an objectionable gap on the floor of the retort at the hottest point. But few, I think, would nowadays recommend single retorts, with an external wall at each end, on account of the additional loss of heat by radiation.

But this is a digression which please excuse; and I will now briefly explain the drawings and the operations, and afterwards state the results of the first three experiments as given in the table. (See p. 757).

Before commencing the operation of charging the retorts, both ends of the feed-pipes A are closed by the sliding-plate B, and the throttle-valves D respectively. The broken coal is then tipped into the hopper; and by means of the lever C, the sliding-plate B is moved until the holes in it are concentric with the feed-pipes A, whereupon the coal falls into the five pipes as far as the throttle-valves D, the sliding-plate is then moved back into its original position. Upon working the levers E and E^1, the throttle-valves D are opened; thus allowing the coal to fall



A are feed-pipes. B are feed-valves, afterwards altered to a sliding-plate B^1. C are lever working valves or sliding-plate. D are throttle-valves. E and E^1 are throttle-valve levers. At first all the throttle-valves were connected together by means of one rod; but objections to this appeared, principally that it required that all the valves should be exactly true to their respective seats at one and the same time. A better and more convenient arrangement was found in connecting the levers of the valves of the two upper retorts together, and those of the three lower ones by a separate rod. F are breeches-pipes, forming a junction between the feed and the ascension pipe. G are coal-scoops. H are charging-mouthpieces. J are large hand-wheels, with radiating arms (in lieu of the handles originally provided), for working the racks and frame coupled up to the five retorts. K are scoop racks and frame. L are reversing cranks and spindles. M are discharging-mouthpieces. N are coke cylinders. O are ratchets. P are augering lids.

through the breeches-pipe F, into the scoop G, which is in position within the mouthpiece H. The levers had to be worked to-and-fro several times, to cause the whole charge to clear the valve, which caused an obstruction when opened to the extent of about one-third of the area of the pipe. After the coal has fallen, the throttle-valves are immediately closed.

The five scoops G with the coal in them are now propelled into the retorts by the frame and shafts K, which, in their turn, are actuated by the hand-wheels J. When the scoops have advanced into the retorts the required distance, they are turned over by working the cranks L, depositing the coal on the bottom of the retorts. The scoops are now drawn back into the charging-mouthpieces H, by reversing the motion of the hand-wheels and the frame and racks K, and are then turned into their original positions ready for the next charge. As the scoops advance into the retorts, they are intended to push forward the partly carbonized coal, and the coke in front of them, causing that portion nearest the discharging end to fall through the mouthpieces M into the coke cylinders N. When the coke has cooled down to blackness, or earlier if found more convenient, the cylinders N are rotated by working the cranes or ratchets O connected to the spindles and spur-wheels; the coke falling out of the cylinders into iron barrows or other suitable receptacles. The cylinders are then reversed, ready to receive the coke forced out at the next charge.

With regard to the setting, for convenience in firing and economy in labour, the furnace in the usual way would have been best put at the coke cylinder end, so that the coke required for fuel could have been supplied direct to the furnace. But for the purpose of these trials, and to save the expense of underpinning the existing bench-walls, it was placed at the opposite side; and this undoubtedly is the best position for securing the highest temperature at the point where most required. At the same time the arrangement caused considerable inconvenience to the firemen, through their having to work in a cramped up position under the gearing, against which they were liable to get a severe knock when withdrawing from the furnace.

As will be noticed from the figures in the table, with the exception of the coke, which was of good size, and fully equal to the usual weight per ton of coal, the results were eminently unsatisfactory, compared with those obtained from the same coal under the ordinary method of working.

Although the slope of the retorts was 50 per cent. greater than those at Ludlow, the principal difficulty encountered in each of these trials, was the continual heaping up of the coke, or partially carbonized coal, about a yard from the feeding end of the retort, until the area at that point became almost, if not completely choked, when it took more power than the two men could apply to the gearing to even move the obstruction, which had to be got over by using a small rake through the opening in the cylinder cover P, and gradually drawing it down. The idea of the inventor was that the solid end of the scoop, as it entered with the fresh charge, would easily drive the whole mass in front of it forward; but this is precisely what in these trials it failed to do. On the contrary, the previous charge doubled up like india-rubber, taking the form of a camel's back, not possessing the necessary rigidity to advance against the resistance offered by the weight of the material ahead. Notwithstanding the effort made to maintain the feeding end of the setting at as high a temperature as possible, by directing the bulk of the furnace gases to that side, the frequent charges of coal lowered the temperature at that point so much that, at the end of the hour, the previous charge had only been reduced to a soft pitchy condition, void of any sliding propensities whatever. Difficulty was also experienced in keeping the throttle-valves in the feed-pipes gas-tight; for although they were so at the outset, the accumulation of pitchy deposit on the faces soon rendered them more or less leaky—the usual result of valves placed in such a position—so that when the coal feeding took place, a lot of gas was lost through the feed-ports in the hopper, and to a smaller extent it escaped there continually from the same cause when the feed-ports were closed, as those valves also could not be made anything approaching gas-tight. The author thought that the difficulty with the throttle-valves might have been overcome by the introduction of a continuous sliding-plate, as arranged for the hopper, but between two planed faces. On further consideration, however, and after talking the matter over with one who had considerable experience in such work, he concluded that even such an arrangement, although it might perhaps prove an improvement upon the valves, would not work so satisfactorily as to warrant an expenditure in that direction. He, therefore, abandoned the idea. The valves—then top and bottom—were one source of loss as regards gas, and consequently tar and ammoniacal liquor; and another was the escape which took place each time the coke cylinders were emptied. Though the operation of discharging was quickly performed—not taking more than three minutes for the ten mouthpieces per hour—the escape from each cylinder was about 20 seconds per charge, equal to 8 minutes per 24 hours, which, at first thought, appears insignificant. But, on the ordinary plan (hand-charging), the duration of the escape of good gas amounts to about 1½ minutes per mouthpiece per charge, or a total of but 6 minutes per 24 hours—being 25 per cent. less than this continuous method. But taking into account the loss which also frequently arises upon the opening of the lids when the charge is not thoroughly spent at the end of the period allowed for distillation on the customary plan, the author is of opinion that there cannot be much difference in the two systems under this head.

A third source of loss was during the removal of the augering-lid P to clear the pipes, and to draw the coke forward, which (as shown by the remarks in the tables) was frequently required. Leakage from the glands in the covers at the charging end, through which the scoop-rod was worked, also contributed to the total loss. The author attributes, as a further and perhaps the principal reason, the heaping up of the imperfectly carbonized coal before alluded to (which, forming a block practically the full area of the retort, would leave but little or no passage for the gas on one side of it); a deal of condensation taking place in the closed ascension-pipe, and gas escaping through the pores of the retort under the extra pressure existing at times. When working up the coke cylinder end, the tar from condensation would fall into and around the scoop, rendering it in a condition to "stick" to some of the coal at the next charge, instead of delivering it when turned over; its capacity being thus gradually reduced. And there is no doubt that the surface of the cast-iron feed-pipe from the outlet to the valve contributed to the condensation at that end of the setting.

Stopped pipes also played an adverse part; and this nuisance is aggravated in a process requiring the unbolting of cover-plates and augering amidst racks, spindles, &c. But allowing for all these drawbacks, it appears to the author that there is a margin of loss which he has not, and is unable to account for; and he hopes that the discussion which may follow the reading of this paper, may indicate further sources of loss than those he has thought of and touched upon.

Soon after starting, it was found that the circular slide-valves arranged in the coal-hopper, as shown by the drawings, although fitted with clearing-ploughs, would not act efficiently—the continuous shaft and the valve attachments preventing the coal dropping freely into the feed-pipes A. The connections to the shaft also dragged part of the coal to-and-fro as the valves were moved, and also formed a gradually increasing obstruction of coal between the outer valves and the ends of the hopper; so that at times it was impossible to move the valves at all without very great strain. Between the second and third trials, therefore, the author had all these valves removed, and substituted, in lieu thereof, a continuous sliding-plate, having holes cut in it of the same diameter as those over the coal-delivery pipes, worked by the same levers at either end of the hopper as before. This resulted in an improved feed, although with that arrangement, as well as the former, the coal would wedge and lodge at times in the hopper in the form of an arch, which had to be broken through from the top before another charge could be given. The feed-pipes would also choke at times below the hopper, through the trickling down of tar, the result of condensation of the gas that had escaped through the throttle-valves. This latter inconvenience might, perhaps, have been partly or wholly obviated, had the feed-pipes been made of a larger diameter towards the throttle-valve, instead of being quite straight.

As Mr. Elliott attributed the non-success to the "jamming of the coke against the sides of the coke cylinders," which, through an oversight on the part of the contractors, had been made with openings of somewhat less width in the clear than the retort at the cylinder end, the operations were entirely suspended for a time, and others were ordered from them with a coke-way of equal width to the retorts, and a fresh start was made with these on one bed only on Aug. 25 last; the throttle-valves, sliding-plate in the coal-hoppers, ascension-pipes, and feeding-pipes having been, during the interval, thoroughly cleaned and adjusted, and the retorts overhauled and repointed. In addition, the rod which, in the last experiment, passed through, as well as the sloping-plate in the scoop, were (at Mr. Elliott's suggestion) removed. These had been an obstacle to its filling evenly; the coal, in falling from the delivery-pipe, being splashed by the spindle over the edges of the scoop, which, together with the sloping-plate, also materially reduced its capacity.

For the greater part of the time occupied by the first three experiments, Mr. Elliott was present, and superintended the operations; while, during these last trials, the author expressly stipulated that he should be present the whole time—every assistance on each occasion being rendered him to overcome the difficulties which arose, in fact *carte blanche* was given him to do whatever he thought desirable to make the experiment prove successful, if possible. Notwithstanding the alterations referred to, there was practically no diminution of the difficulties which arose in the previous attempts, the coal and coke heaping up as before; and, on the whole, having regard to the superior coal used, the results were equally as unsatisfactory. But while this was so, I would draw attention to the fact that, when the gas was taken off at the cylinder end, the number of stopped pipes was much augmented; confirming, in this particular at all events, the view enunciated at an earlier stage of this paper.

Sanguine as Mr. Elliott appeared to be all along as to ultimate success, on the second day of the final trials, he left, admitting the results were still so unsatisfactory that it was useless to proceed any further with the experiments; stating, however, that he was yet confident that the process was right in principle, and that he would ultimately achieve success. While the author has grave doubts upon this point himself, he would say that, from the large amount of time and labour which he knows Mr. Elliott to have bestowed upon the matter, he is deserving of

Date.	Coal. Description.	Coal. Total Carbonized.	Gas. Total Made Corrected. Bar. & Ther.	Gas. Per Ton of Coal Carbonized.	Gas. Average Jet throughout the Trial.	Gas. Computed Average Illuminating Power.	Gas. Multiple of Make by Illuminating Power.	Residuals. Coke.	Coke. Per Ton of Coal Carbonized.	Coke. Quality.	Tar. Total Made.	Tar. Per Ton of Coal Carbonized.	Liquor. Total Made.	Liquor. Per Ton Coal. 10-oz. Wills' Test.	Remarks. Direction of Gas.	Retorts Blocked with Coke and Coal.	Single Charges Missed.	Times Coal Delivery Pipe Blocked.	Times Scoops Fixed.	Ascension and Arched Pipes Stopped.
1890.		T. c. q.	Cubic Feet.	Cubic Feet.		Candles.		T. c. q. lbs.	Cwt.		Gallons.	Gallons.	Gallons.	Gallons.						
	First Trial.																			
Oct. 14 to ,, 18	Gas nuts from Derbyshire district	11 12 0	112,131	9,666	0·99	11·94	115,412	Coke 6 7 0 0 Breeze 14 3 8 Dust 8 0 16 Total 7 9 3 24	12·91	Fair and Large.	57	4·91	370	31·9	Going up charger end.	10	7	6	..	..
	Second Trial.																			
Oct. 21 to ,, 25	Gas nuts from Derbyshire district	18 18 0	158,644	8,393	0·792	16·78	140,834	Coke 10 4 2 0 Breeze 1 6 2 6 Dust 1 0 3 20 Total 12 11 3 26	13·33	Ditto.	120	6·34	608	32·2	Ditto.	105	2	..	8	..
	Third Trial.																			
Oct. 28 to Nov. 6	Gas nuts from Derbyshire district	38 5 0	294,067	7,688	0·94	12·52	96,253	Coke 21 10 3 0 Breeze 2 14 1 0 Dust 1 13 3 14 Total 25 18 3 14	13·57	Ditto.	196	5·12	1033	27·02	Going up cylinder end.	Rake used at cylinder end almost regularly to prevent blocking.	52	..	36	60
			10,414	..	**16·10**	**167,665**			**13·00**	**Fair.**	..	**12·13**	..	**40·81**						
1891.	Fourth Trial.																			
Aug. 25 to ,, 29	Welsh coal, broken up by hand to a suitable size for the hopper . .	6 18 2	55,565	8,023	0·755	15·77	126,522	Coke 3 16 0 0 Breeze 5 1 7 Dust 4 1 4 Total 4 5 2 11	12·36	Very good large.	37	5·34	113	16·26	Going up cylinder end.	30 (Also the Jet Exhauster was filled with a sooty deposit twice.)	20	..	18	28
	Fifth Trial.																			
Sept. 5 to ,, 12	Welsh coal, broken up by hand to a suitable size for the hopper . .	14 3 0	113,630	8,030	0·727	16·33	131,129	Coke 7 13 3 0 Breeze 13 3 17 Dust 7 1 17 Total 8 15 0 6	12·37	Ditto.	87	6·14	299	21·13	Going up charger end.	56	56	12	25	5
			10,973	..	**17·89**	**196,367**			**13·31**	**Good large.**	..	**14·11**	..	**34·50**						

The figures in heavy type show results from the same coal carbonized in the ordinary way.

General Remarks.—When a retort became blocked with coke and coal, the obstruction was removed by inserting a small rake at the cylinder end, through the opening P. During all the experiments the temperature of the retorts and the exhaust were maintained as nearly as possible uniform. The former averaged about 1550° Fahr., the latter 18½-10ths of an inch against a seal of 2¼ inches—the pressure on the retorts being from 4-10ths to 4½-10ths.

such a reward. (The results of the last trials are also given in the table.)

The capacity of the feed-pipes was arranged for ½-cwt. charges, or 12 cwt. per mouthpiece per diem; this being about 2 cwt. more than the usual charge per mouthpiece for the adjoining ordinary settings (in which the retorts are of the same size). But before the first trial was commenced, Mr. Elliott thought, from his experience of working the apparatus, that ½-cwt. charges were somewhat too heavy for the temperature of the settings, and he suggested a reduction, with a view of overcoming some of the difficulties encountered. This was done by introducing a short length of wrought-iron pipe, 6 inches diameter, within the feed-pipe just under the hopper; but as this alteration did not have the desired effect, the pipe was removed before the second trial was started. On account of the difficulties met with—charges missed, and so on—the actual weight carbonized in the subsequent trials also works out considerably less than the original estimate; varying, as can be deduced from the table, from a minimum of about 7 cwt. to a maximum of 9½ cwt. per mouthpiece per diem. If this large reduction of duty per mouthpiece could not be eventually improved upon, the author is of opinion it would of itself be sufficient to condemn the system.

During all the experiments, the tar and liquor produced in the hydraulic main ran with the gas through the condenser-pipes along the retort-house wall to the inlet of the scrubbers (all the balance of ammonia not eliminated by the condensed steam from the jet-exhauster, was extracted by the scrubbers), from which point both were conducted, together with the scrubber liquor, into one tank from which they were pumped into a measuring-tank, and the quantity of each very carefully ascertained at the end of the experiment after due time had been allowed for the tar to separate from the liquor. While the yield of tar in all cases was absurdly low, the ammoniacal liquor from the nut coal was not much below that usually obtained from the same coal; yet it was very remarkable that, under the Welsh coal experiment, the yield was but about half

of the normal production—appearing to the author quite out of proportion to the diminution due to the low yield of gas from the various causes related.

As the labour required in working an experiment upon the scale at Swan Village, would necessarily be much heavier than would be the case for a whole bench of retorts when steam or other motive power would be applied for the operations, no useful comparison can be made under this head. But it may be stated that two men per turn of twelve hours were required to do all the work of filling the hoppers, feeding, emptying coke-cylinders, and wheeling the coke away, &c.; the total time occupied for all the work being about two minutes per retort per charge.

In each experiment, the coal was raised in sacks by a winch and tipped into the hoppers by the attendants; but if the system had proved, or were to prove successful, for its application on a large scale coal-breakers would be provided, and the hoppers fed by the aid of elevators and conveyors as pourtrayed by Mr. Elliott in the JOURNAL OF GAS LIGHTING.* In addition to this arrangement, the acme of perfection as regards economy in labour would be a system of gearing, whereby the coke-cylinders would be made to open simultaneously with the charging operations hourly, or at such intervals as might be found in all respects the most advantageous. Some such plan was devised by Messrs. R. and J. Dempster, of Manchester; but it has, hitherto, the author believes, proved impracticable. Messrs. Dempsters' proposals are not very dissimilar to those of Mr. Elliott, except that, instead of a scoop, a piston drives forward the fallen charge. The author understands that an experiment of Mr. Elliott's plan with this modification, and with retorts set at a much greater angle, is about to be tried at the Vauxhall works of the South Metropolitan Gas Company; and through the courtesy of Messrs. C. and W. Walker, of Donnington, who are making the ironwork for it, and with the permission of Mr. C. C. Carpenter, the Engineer of the Vauxhall works, he is enabled to submit full particulars of this arrangement for the inspection of the members.

One of the members of the Association, when at the Swan Village works, having expressed to the author that he would expect the gas to contain a larger percentage of carbonic oxide than gas produced in the ordinary way, samples were analyzed; the result being—

	CO.
From ordinary manufacture	8·6 per cent.
„ Elliott's process	10·0 „

Showing no great difference in this particular.

In connection with the trials of this process, the truth of the adages that "history repeats itself," and "there is nothing new under the sun," is again strongly exemplified. Many, if not all of you, are doubtless aware that neither Mr. Elliott nor Messrs. Dempster are the first to propose this system of continuous carbonization, and that it was advocated by Mr. Brunton 50 years ago, and adopted by him singularly enough at the same Swan Village Gas-Works, which is a station of the late Birmingham and Staffordshire Gas Company; he having been at that time their Engineer.

It is a remarkable coincidence that one of Brunton's successors should be, as it were, celebrating the jubilee of the first introduction of such a system, by trying it anew at the same works. Brunton's invention is illustrated and fully described in Clegg (p. 77, 1841 edition).† The author has had the drawings reproduced from that work, and hung upon the walls that the members may make a comparison between Brunton's and Elliott's arrangements; and it may not be out of place to remind you of the remarkably descriptive letter from Mr. Brunton to Mr. Clegg, jun., respecting his invention.‡ Brunton's invention is also briefly described in Richards's revised edition of Mr. Hughes's "Treatise on Gas-Works;" the concluding paragraph being; "Mr. Brunton claimed great superiority for this description of retort; and about 1840, it excited considerable attention, was tried in several places, but was not a success."

We have at present at the Swan Village works, an old bricklayer who was engaged with his father in setting these Brunton retorts, and also two of the stokers who worked them, one of whom states that they were first tried in 1837 at Swan Village, and consisted of eight beds of three retorts each—all the work being done by one man and one lad per shift of twelve hours; and after being tried there for a few years, the same patent was applied to some settings at the Adderley Street works, in 1841. There is no record as to the cause of the abandonment of the system of which Brunton speaks so well in his letter to Clegg; but in answer to my inquiries the other day, the bricklayer at Swan Village stated that he always understood it to be due to a dispute about the patent rights, which ended in Brunton being prohibited from continuing their use at both works. The old stoker, however, thinks that the difficulty experienced in selling the saturated coke also contributed to the abolition of the system; but, in the author's opinion, it was more probably due to non-success, or to the general introduction of clay and longer retorts.

It will be observed that iron retorts were then used, and that the length was but 4 ft. 6 in.; the bottom sloping at an angle of 7½°. With such short retorts, the difficulty of discharging the coke would probably not arise. It will also be noted that Brunton brought the furnace partly out beyond the face wall of the setting, with the view no doubt of maintaining as high a temperature as practicable at that end of the retort, that each charge of coal might be fairly well carbonized by the time it had to be pushed ahead—a condition of which he appears to have recognized the necessity, if any degree of success is to accompany any such system of working. It will be noted that he did not use a scoop, but adopted the piston or disc arrangement, as recently proposed by Messrs. Dempster, depending on the piston to push forward the new charge of coal as well as the coke beyond it—a plan which Mr. Elliott now advocates in lieu of the scoop.

Although we may not all agree with Brunton's view as to what takes place in the retort after charging, as expounded in his letter to Mr. Clegg just read, it will be noticed that he lays particular stress upon the fact of his process reducing the quantity of tar liquor, in those days both a source of trouble and nuisance. (What a deal we owe to science for the change that has been brought about since then as regards the value of these residuals!) The results at Swan Village confirm Brunton's experience in this respect; but unfortunately accompanied by a much *smaller* yield of gas, instead of his claim for a large increase. His views as to the effect of forcing the gas over a large body of red-hot coke appear to agree with modern notions upon the subject, although we now try to avoid the "more perfect decomposition" which he aimed at, by *limiting* to as short a period as possible the contact of the gas with highly heated surfaces.

Reverting to the proposals of Mr. Elliott and Messrs. C. and W. Walker for the Vauxhall works, it should be mentioned that, before arranging the detail, Messrs. Walker were invited to avail themselves of our experience at Swan Village; and their representative spent some time watching the operations, with the view of introducing such improvements as, from the difficulties and drawbacks encountered there, might seem desirable. The principal difference is the length of the retort and the angle of inclination; being 20 feet (on the slope) and about 25° respectively—the form of coal-hopper being slightly different, fitted with a continuous sliding-plate on the underside instead of the inside, having much larger feed-ports and slightly larger feed-pipes, and one ascension-pipe only, and this on the charging end. The scoop is abandoned and a piston substituted, so that the charging-mouthpiece stands out but 6 inches from the face of the bed, and the coals drop down a slope in the feed-pipe on to the bottom of the retort direct more after Brunton's patent; the piston travelling 4 feet at each fresh charge, as against 2 feet at Swan Village. The coke cylinders are 25 inches in diameter by 22 inches wide, compared with 20 inches by 20 inches; the angle of inclination of the discharging-mouthpiece being 15° greater than that of the retort, instead of the same degree as at Swan Village.

An objection to work retorts upon this principle set at a much greater angle—like all arrangements for inclined retorts upon Coze or other similar plans—is the necessity for a stage floor, or travelling stage for charging at a considerable elevation, and the great waste of space above the discharging and below the charging end of the setting. But in the case of gaseous firing upon the regenerator principle, the latter may be more or less profitably utilized for the regenerator. If this great angle, as proposed for the Vauxhall works, be actually necessary for the Elliott principle, I cannot see that anything is to be gained over the Coze or such-like systems. On the contrary, the cumbersome gearing required for the former, whether worked by hand or steam power, as compared with the simplicity of the various arrangements which have recently been devised for charging ordinary inclined retorts, is a drawback which we should all desire to avoid.

Although the author would have felt happier, and better pleased, had he been able to stand before you and show that the process he has tried was one that could be taken up by the profession with advantage, still, as it is admitted that as much as, if not more, is to be learned from failures than from successes, he hopes the particulars given will be of interest and useful for reference, and may lead to a profitable discussion.

Mr. Edmund Stevenson, M. Inst. C. E., of the firm of Messrs. Stevenson and Burstal, of Parliament Street, Westminster, who left England towards the end of August last for San Francisco, at the request of an influential Syndicate, to report upon the establishment of new gas-works in that city, and on the gas undertakings of other places in the United States, has returned to England, and resumed his professional work.

Death of Mr. J. Davies, of Brisbane.—The death of Mr. John Davies, Engineer of the South Brisbane Gas Company, is announced in the Queensland papers. Mr. Davies was for many years Manager of the Kidsgrove Gas-Works; and he left England for Australia about ten years ago, principally on account of his health. He had been engaged in erecting gas-works in various places in the Antipodes—amongst others, those at Numea, New Caledonia, the French penal station; and he finally settled in Brisbane. News of his death will, we are sure, be received with considerable regret by a number of his old friends in England.

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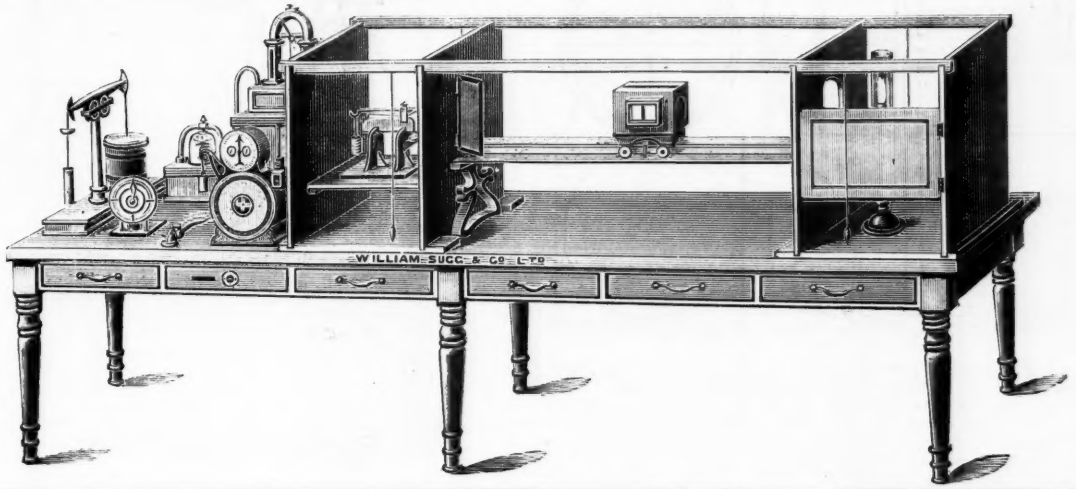
* See JOURNAL, Vol. LIV., p. 877.

† Brunton's system, here alluded to, was described and illustrated in "King's Treatise on Coal Gas," Vol. I., pp. 179-81.

‡ The author here read the lengthy letter referred to, as it appeared in "Clegg's Treatise."

THE STANDARDS DEPARTMENT AND THE VERIFICATION OF PHOTOMETERS.

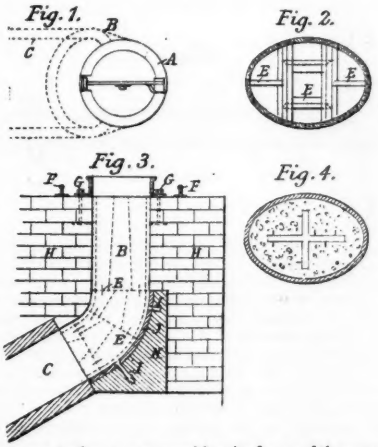
In the JOURNAL last week we gave a drawing and description of the form of Evans photometer which has been sanctioned by the Standards Department of the Board of Trade for the use of gas companies working under the Gas-Works Clauses Act. We now give an illustration of the Letheby photometer as approved by the Department. All instruments of this type are to be used in a room not less than 12 feet by 10 feet, and 10 feet high; and the walls of the room are to be darkened with lampblack or other suitable material, to prevent reflection from affecting either of the lights to be compared. The top of the bench forms part of the instrument; and the whole must be fixed so that no alteration can be made in the length of the bar. We mentioned last week that a Letheby photometer had been stamped by the Standards Department for the Leighton Buzzard Gas Company; and we now learn that one has been passed for the Whitby Company.



REGISTER OF PATENTS.

The Setting of Inclined Gas-Retorts.—Van Vestraut, L., of Southall. No. 17,201; Oct. 28, 1890. [6d.]

The claim for this invention is for constructing in brickwork the opening which is continuous with the inside of the retort, by means of a moveable core or mould. Fig. 1 is a plan of the lid or cover; fig. 2, a plan of the top of the mould; fig. 3, a vertical section of the entire apparatus (the dotted lines denote the various parts or portions of the mould or core); and fig. 4, the top of the sand or loam baked mould or core.



A core as shown in fig. 4, or a mould as in fig. 2, of the required section is affixed to the upper end of the retort C, so that it is continuous with the inside of the retort; and, as the back wall H of the setting is being constructed, it is enclosed with ordinary fire-brick work or fire-clay lumps, or any other suitable material. When the brickwork is set, the core or mould is removed, leaving the connecting channel B *in itu* from the retort to the top of the setting.

The mouthpiece is provided with a cover or lid A, and bolts G; and, if required, a metal plate J shaped to the retort and a core fixed to the brickwork by bolts or dowels I, or a block C of the requisite shape and hardness, is built in the brickwork where the coal or other material falls. Rails F are laid at any convenient part above the setting, to permit a hopper or truck to travel thereon, in order to charge material down the shoot B into the retort. The core can be made of any shape required and of any suitable material or wedge-shape blocks E dowelled together, so as to be easily removable after construction.

Gas Heating Apparatus.—Brophy, M. M., of High Holborn, London. No. 18,457; Nov. 15, 1890. [8d.]

This invention for heating hot-plates, cooking and ironing stoves, boilers, and other apparatus, by utilizing the waste heat for heating the air necessary for the combustion of the gas, is carried out by providing a basket containing asbestos fuel or other incombustible material, in conjunction with atmospheric or other burners. In order to heat the air for supplying the atmospheric burners, and thus obtain a higher state of incandescence in the fuel than would otherwise be possible, there is placed at each side of the basket a regenerative chamber also containing incombustible material, and communicating with the chimney; a valve, operated as described in patent No. 6660 of 1890, being employed for placing the regenerative chambers alternately in communication with the chimney and with the air. Around the basket is a casing for preventing atmospheric air from passing directly to the burners, the interior of which is in communication with the regenerative chambers. In operation, the heat produced by the burners is allowed to escape through one of the regenerative chambers for a certain time, until the material therein is thoroughly heated. The valve is then reversed, and the products of combustion will pass through the other regenerative chamber to heat its contents; the air for supporting combustion being caused to pass through the heated material in the chamber, so as to allow the air to become highly heated.

Manufacture of Hydrogen.—Lewes, V. B., of Greenwich. No. 4134; March 7, 1891. [8d.]

This invention has for its object the economical manufacture of hydogen on a commercial scale. It is produced by the decomposition of steam by contact with finely-divided heated iron, as is well understood. But, in order to quickly and effectually reduce the resulting magnetic oxide to the metallic state for re-use, the patentee proposes to subject it to the reducing action of gases containing hydrogen produced by the decomposition of steam by carbon in a state of incandescence. In this way the oxide of iron can be reduced far more rapidly and completely, and at a lower temperature, than by the use of carbon monoxide alone, as heretofore proposed. Gases containing hydrogen can be easily and cheaply obtained for the purpose mentioned, by blowing steam (or a mixture of air and steam) into and through the mass of incandescent fuel in a gas producer, which may be that employed for heating the retorts containing the finely-divided iron used for decomposing steam according to the invention described in patent No. 20,752 of 1890, an abstract of which appeared in the JOURNAL for the 6th ult. (p. 626). In this case the resulting gases—consisting of carbon monoxide, hydrogen, and nitrogen—will, when the oxide of iron is to be reduced to the metallic state for re-use, be passed into and through the retorts direct from the producer.

In order to obtain metallic iron in a finely-divided condition, so that it shall offer a large active surface to the steam to be decomposed, and so that the resulting oxide of iron shall also offer a very large surface to the reducing action of the gases used to reconvert it to the metallic state, material of a porous refractory nature—as, for instance, asbestos or pumice stone—is saturated with an iron salt that is easily decomposed by heat into oxide of iron, which is subsequently reduced to the metallic state by gases such as those already mentioned. Suitable iron salts for this purpose are, for example, sulphate of iron and oxalate of iron Or the same results may be obtained by kneading together moist hydrated oxide of iron, fine iron filings, and asbestos fibre, and making the mixture into balls, which are afterwards hardened by baking. These, on reduction by the gases, become porous, and are easily permeable by the superheated steam.

Incandescent Gas-Lights.—Moeller, J., of Palmer Street, Westminster. No. 5022; March 20, 1891. [8d.]

This invention relates to "the production and application of a combustible fluid mixture of air and hydrocarbon vapour, available for ordinary illumination in localities where gas cannot be obtained, and applicable also for heating or for producing the brilliant light known as the incandescent gas-light."

When the fluid mixture is to be used in ordinary burners, instead of gas, for impregnating air, I employ liquid hydrocarbons of the benzolene class, of specific gravities varying from ·620 to ·670. When the fluid

is to be used in a burner of the Bunsen kind for heating generally, or for raising to incandescence a refractory hood or mantle, heavier liquid hydrocarbons are used, of specific gravities varying from ·680 to ·720. In either case, the same apparatus is needed for supplying and impregnating the air with the hydrocarbon vapour, and governing the pressure of the fluid mixture.

Fig. 1.

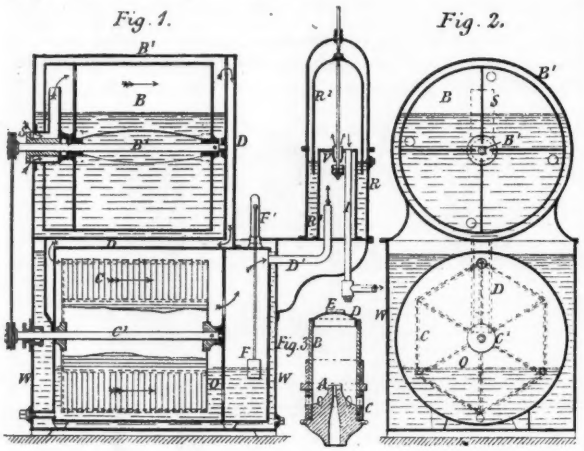


Fig. 2.

Fig. 1 is a longitudinal section, and fig. 2 a transverse section of the combined air-supplying, carburetting, and governing apparatus.

The air supply is effected by the revolution of a drum B, partitioned like that of a wet gas-meter, more than half immersed in water, within a casing B^1, through which air is drawn in at S, and, passing through the compartments of the drum, is caused to issue by a channel D to the carburetter below. This is a vessel placed within a water-casing W, and containing in its lower part the hydrocarbon liquid O, the level of which is indicated by the stem of a float F visible in a glass tube F^1. Within the vessel is a horizontal revolving shaft C^1, having fixed on it a drum C of perforated metal with perforated radial partitions. Fibrous material—such as cotton or wool—is loosely turned over the partitions and around the drum. As the drum revolves partly immersed in the hydrocarbon, the cotton or wool becomes soaked with the liquid; and the air passing through and around the drum (as indicated by the arrows) takes up a quantity of the vapour, and the mixture of air and vapour passes by a pipe D^1 to the governor. The water in the casing W of the carburetter, besides adding to the safety of the apparatus when comparatively light hydrocarbons are being used, serves also to prevent refrigeration resulting from the evaporation of the hydrocarbon; and in order more fully to provide against this in cold weather, the casing may communicate with a tank containing a considerable body of water.

The governor consists of a vessel R containing water in the annular space around an inner compartment R^1, in which is arranged a valve V, having its stem attached to a floating-bell R^2, which dips into the liquid below. The combustible mixture of air and benzolene vapour passes through the valve into the bell, and thence by a pipe I to supply the light. As the pressure in the bell increases, the bell rises and more or less closes the valve V, allowing less of the gaseous mixture to pass into the bell. The pressure of the supply to the lights is thus regulated according to the load on the bell.

The regulating-valve V may be of the paraboloid form commonly employed for bell gas-governors. It is preferred, however, to use a valve such as is shown in fig. 1, consisting of a cup containing mercury suspended from the bell R^2, and a stationary tube projecting down into the mercury. This tube has a V-shaped opening at its side (or several of them), so that the more deeply the tube is immersed in the mercury, the less passage is afforded through the openings in its side. The shaft of the revolving carburetter C is driven by chain gearing from the shaft B^1 of the blower B; and this shaft may be driven by any convenient motor—such, for instance, as a weight or spring which is from time to time wound up, and which by suitable gearing drives the shaft at a speed determined, within certain limits, by the quantity of combustible fluid consumed. Thus, when the cock on the pipe I is fully open, a considerable quantity of gaseous mixture can pass without increasing the pressure in the bell, and the blower and carburetter can revolve at their maximum speed. When, on the other hand, the cock on the pipe I is closed, the pressure resisting the movement of the blower increases until the weight is no longer capable of driving it.

The burners employed when the air is carburetted by the lighter qualities of hydrocarbon are of the ordinary kind used for gas. When the heavier qualities of hydrocarbon are employed to carburet the air, the burner employed must be of the Bunsen kind.

Fig. 3 is a vertical section of a burner of this kind, which is especially applicable for heating to incandescence a refractory mantle. A is the nozzle by which a jet of the combustible fluid mixture issues into the tube B, into which air enters by lateral holes governed by a rotating-valve C. The top of the tube is covered by wire gauze D, the central portion of which is closed by a button E. The mixture of air and combustible fluid issuing through the wire gauze, being ignited, produces a flame of great heating power, which may be applied for heating to incandescence a refractory mantle supported above the burner.

Charging and Discharging Gas-Retorts.—Keetman, T., and Bach, W., of Duisburg, Germany. No. 8067; May 11, 1891. [8d.]

This invention relates to an apparatus "for performing the several operations required for charging gas-retorts and like vessels with material—coal, for instance—which it may bring from a distance, and for discharging the same, and carrying the used or exhausted material to a place of deposit."

Fig. 1.

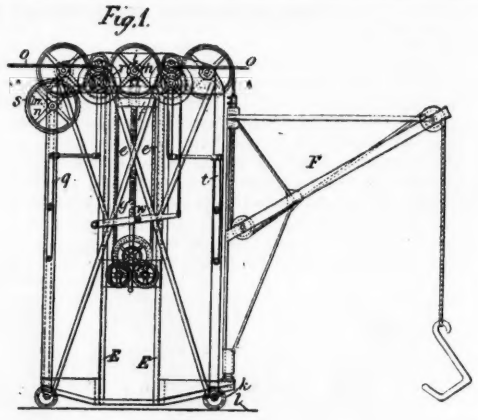


Fig. 2.

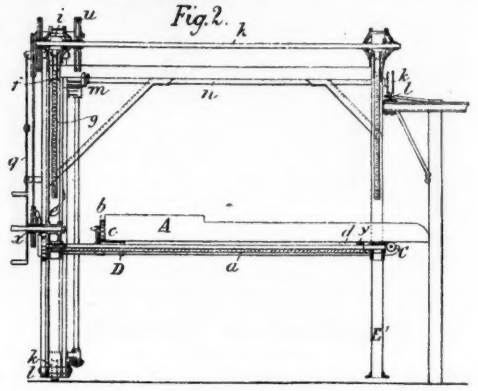


Fig. 3.

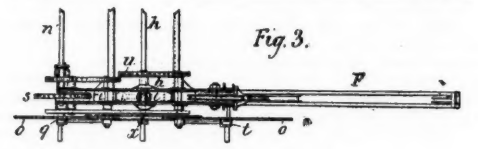
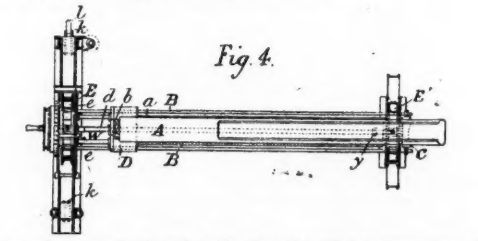


Fig. 4.



Figs. 1 and 2 are a back and a side elevation of the apparatus. Fig. 3 is a plan of a portion thereof. Fig. 4 is a horizontal section of fig. 2.

A is a metal charging and discharging scoop, corresponding to the shape of the retort, for introducing the coal and removing the coke. It is carried on a vertically moveable bed or rails B, fitted with a roller C, upon which one end of the scoop rests, while the other end rests on a slide D, that may be slid along the bed B for readily moving the scoop forwards and backwards. Underneath the slide there are placed two screw-nuts, in which work two corresponding screw-rods *a*. By turning these, the slide is moved forwards and backwards. A toothed wheel *b* is fixed to the scoop; and it engages with the wheel *c* on the square shaft *d*. This arrangement is for turning round or tilting the scoop. The bed B is guided in its vertical movement by its ends in columns E E^1; being brought about by connecting the ends through plates *e*, with slides *f*, so that, when these ascend or descend, so also must B. These slides have an internal screw-thread, and are worked up and down by vertical screw-rods *g*, driven from the shaft *h* through bevel gearing *i*. The whole apparatus is carried on wheels *k*, and may be run on rails *l*, by operating the bevel gearing *m*, through shafts *n*.

Power for working the apparatus is transmitted from a motor by means of an endless rope or band *o*, running on three pulleys—the first for moving the whole apparatus along the rails, the second for raising and lowering the bed, and the third for the horizontal displacement and the turning round or tilting of the scoop.

The whole apparatus is moved along the rails by operating a lever *q*; thus moving an eccentrically located shaft or bolt, on which a rope pulley, with a friction-wheel *r* connected thereto, turns. There are also other friction-wheels so arranged that, according as the lever *q* is moved to the right or left, the one or the other of them is pressed against by the friction-wheel *r*. For raising or lowering the bed B to adjust the position of the scoop A, an arrangement similar to that required for moving the whole apparatus is employed. By operating the lever *t* and the rod in connection therewith, a friction-wheel is pressed against one of two wheels; thus driving the toothed wheels *u* and shaft *h* in the one or the other direction. This motion is transmitted through bevel gearing *i* to the vertical screw-rods *g*, to which the slides *f* serve as nuts. Plates *e* connect the slides *f* with the

bed B. F is a crane; the mechanism for working it being combined with the last described arrangement. At nearly the lowest position of the bed B, one of the two slides *f* strikes against a bolt *w* fixed in between levers. At the end opposite to that of the point of oscillation, there is attached a rope or chain, which runs over pulleys. When the slides descend to the bottom, one of them, commencing from the point where it strikes against the bolt *w*, carries the rope along with it to lift the scoop A, and bring it on to the bed B.

The horizontal displacement of the scoop A or its introduction into, and withdrawal from the retorts, is effected through a rope pulley, also mounted on an eccentric bolt or spindle *x*, and with a friction-wheel fixed to or connected therewith, which may, by operating a lever, be made to engage to the left or right with friction-wheels. Each of these is cast in one piece with a toothed wheel, and respectively fixed on horizontal screw-rods *a*, provided the one with a right-hand and the other with a left-hand thread. According as the hand-lever is operated, the one or other of the rods will be driven direct by the friction-wheels, and so as, by the toothed wheels, to drive the screw-rods in opposite directions. As the screw-nuts in which the rods work are fixed to the slide D, this is moved forwards or backwards according as the lever is operated. The means for automatically turning over or tilting the scoop consist of the square shaft *d*, provided at each end with a stop-piece *y*, against which the slide D strikes in both of its end positions. In this way the square shaft has a tendency to move in the direction of its length—being carried by D when this comes against either of the stop-pieces. Upon this movement taking place, the shaft *d* is simultaneously turned round by the action of the screw-thread, and therewith also the box and toothed wheel *c* as shown. Without the toothed wheel *b*, no tilting takes place. When this part of the apparatus is to be worked, the lever is moved on one side, so that wheels are set in rotation; and the scoop is thereby introduced horizontally into the retort to remove the coke therefrom. When the scoop has quite entered the retort, the lever is reversed, turning the travel of the scoop, and bringing it backwards horizontally until it attains its former position. That lever is now disengaged and the lever *q* operated to drive the whole apparatus on wheels *k* to the place for unloading the coke in the scoop, and by another disengagement and operation of the lever to the place for loading coal into the scoop. The lever *t* is then operated to lower the bed B, in which movement the crane rope or chain with the scoop-carrier is raised; and the scoop set in it lowered, released, charged with coal, hoisted, and manipulated inversely to the discharging operation.

APPLICATIONS FOR LETTERS PATENT.

17,342.—Bickerton, H. N., "Improvements in prepayment meters for gas and other fluids." Oct. 12.

17,364.—Evers, M., "Improvements in gas motor engines." Oct. 12.

17,387.—Whitehouse, J., "Improvements in chimneys for paraffin and other oil lamps, also applicable to gas light chimneys." Oct. 13.

17,447.—Settle, T., "Improvements in gas and other retorts, and in the method of setting and resetting them." Oct. 13.

17,485.—Leach, A., and Greenwood, E. P., "Improvements in gas-fires." Oct. 14.

17,497.—Davies, J. G., "Improvements in portable excavating apparatus for use in laying gas, water, and other pipes for cutting sewers, drains, ditches, foundations, and the like." Oct. 14.

17,510.—Pease, E. L., "An improved apparatus to be used for the purification of gas or for analogous or similar purposes." Oct. 14.

17,545.—Greenhill, M. C., "Improvements in and relating to meters." Oct. 14.

17,557.—Kitson, A., "Improvements in apparatus for manufacturing gas." Oct. 14.

17,587.—Hoskins, W. C., and Crighton, J., "Improved appliances for increasing the illuminating power of gas and other lights, and for neutralizing the noxious effects of the vapours emitted in the combustion of gas or other luminants." Oct. 15.

17,643.—Lyle, J., "Novel means for the transformation of oil into a gas and the utilization of such gas as the agent for heating purposes generally." Oct. 15.

17,645.—Crastin, C., "Improvements in or applicable to atmospheric gas-burners." Oct. 15.

17,673.—Nichols, F. E., "Gas light protector." Oct. 16.

17,724.—Abel, C. D., "Improvements in valve apparatus for gas and petroleum motor engines." A communication from the Gas Motoren Fabrik Deutz. Oct. 16.

17,815.—Evans, E. W., "Improvements in gas-engines." Oct. 17.

Gainsborough Water Supply.—At the meeting of the Gainsborough Local Board on Monday of last week, the Water Committee, having fully considered Mr. Hawksley's report as to the water supply of the town, involving a large expenditure, recommended the Board to authorize them to spend £250 in further testing the artesian well as to the extent of the supply, rather than embark upon Mr. Hawksley's expensive schemes. A counter-proposal was that the Board should move the intake higher up the river and above the sewage pollution area; it being contended that the artesian well water was too hard for domestic use. Such a proposition involved an expenditure of £5000. After a heated discussion, the Chairman supported the views of the Committee; and their report was adopted.

Extensions at the Newtown Gas-Works.—For some time past extensive alterations have been in progress at the Newtown Gas-Works; and the effect of the improvements will be to produce a largely increased quantity of gas at a less cost. The contract for the ironwork was let to Messrs. R. and J. Dempster, of Newton Heath, Manchester; and that for the retorts to Messrs. J. Drake and Sons, of Halifax. The work having now been practically finished, it was decided to celebrate its successful completion by giving the workmen employed a dinner last Friday week. Upwards of forty sat down, among them being Mr. Redman (the Manager of the works), Mr. Oliver Taylor (the Secretary), Mr. J. Brooke and Mr. J. Leach (representing Messrs. Dempster), and Mr. R. Porter (representing Messrs. Drake).

LEGAL INTELLIGENCE.

COUNTY OF LONDON ASSESSMENT SESSIONS.

Sessions House, Clerkenwell, E.C.—Thursday, Oct. 15.

(*Before Sir* P. H. Edlin, Q.C., *Chairman, and a Bench of Magistrates.*)

The Gaslight and Coke Company's Assessment Appeals.

(*Continued from p.* 718.)

At the close of the re-examination of Mr. Corbet Woodall, for the appellants,

The Solicitor-General addressed the Court for the respondents. He said that he really appeared as Counsel for the City of London Union; but he was assisted in the investigation of this enormous matter by a number of learned friends representing other bodies, who had agreed that the opening of this case, so far as the parishes were concerned, should be left to him. This was the largest case probably that had ever come before the consideration of the Court; and it was the most complicated one that could possibly be imagined, because there were not only differences as to the figures which were upon the Gas Company's accounts, but there were also serious questions of difference of principle. In addition, there was the fact that the respondents were not upon some matters wholly agreed among themselves. In respect, for instance, to one question which was so complicated and so difficult that the last witness was not prepared to deal with it—the question of the distinction between productive and unproductive mains—the parishes were not all at one. He, therefore, asked the Court, if in the course of the evidence witnesses expressed different opinions upon the subject, to remember that these gentlemen represented different parishes, which, by the circumstances of their position with regard to the great system of gas-works, were interested in the adoption of different principles. As far as the City of London Union was concerned, he asked the Court to deal with this matter upon the principle which had been recognized practically in a plan which the Company produced. That plan showed red and blue lines of pipes. In the evidence, the Court would find (he would not go into detail unnecessarily) that the distinction between the red and blue lines had been described; and what his clients suggested was that this distinction should be regarded by the Court in determining the question as between productive and unproductive mains, instead of the distinction being adopted such as was now suggested—viz., the distinction of pipes above or below 14 or 21 inches, as the case might be. That was a troublesome case of detail upon which the Court would hear different opinions expressed by the witnesses, which, however, stood aside from the main controversy of this case, and did not much concern the question between the appellants and the respondents as to the distribution of the rateable value among the latter. As regards the main question, the Overseers and the Assessment Committees had some difficulty in dealing with this enormous subject. The assessment had to be made in the month of May, 1890; and the respondents had to deal with the matter upon a valuation supplied by the appellants. Two gentlemen of great experience and great capacity in valuing works subject to rating, were consulted by The Gaslight and Coke Company; and both of these gentlemen had been in Court at different times during the hearing of the appeal. Those gentleman prepared a valuation of the Company's works, copies of which were given to the representatives of the different parishes, in order that the figures therein contained should be considered when the parishes were dealing with the question of the valuation of the works. The value in this estimate put upon the whole system was £243,000. Now both these gentlemen referred to had disappeared from the case; and there was another and different valuation, founded upon different figures—some of them showing enormous discrepancies when compared with the details given to the different parishes by Mr. Vigers and Mr. Castle, the gentlemen to whom he referred. Instead of £243,000, the Court was now asked to say that between £160,000 and £170,000 was the proper amount. Even in the printed appeal lodged in the first instance, the figure given was £234,000—a sum very largely in excess of that which was now being contended for. The City of London Union came before the Court to deal with a rateable value of £15,000; but they were at once told that the circumstances of the time which passed while the assessment was being considered—circumstances which could not be ascertained and judged until after the period at which that assessment had been made—were such that the Company had experienced more difficulty, more burden in the conduct of business, and that the business therefore had become of less rateable value. Thus, although an adjournment of the Court was made for the purpose of showing that the more recent figures had rendered the concern of less rateable value and not of more, the figure of £15,000, which was stated to be the amount at which they ought to be assessed in the City of London Union, was withdrawn, and the figure of £24,000 substituted for it. He therefore hoped the Court would consider the history of this appeal and the extreme difficulty which the advisers of the Overseers and the Assessment Committees had in dealing with this matter, not only because of the magnitude and complexity of the concern, but also because of the course which had been adopted by the appellants. He had endeavoured to reduce, as far as possible, the number of items in controversy. He had taken Mr. Jones's figures, and asked that those figures should be looked at critically—not with the desire of quarrelling with as many of them as possible, but with the desire of quarrelling with as few as possible; and where there had been a question whether one item was a little too much or another a little too small, they had thought it better that the little inaccuracy which they believed to exist should remain undiscussed and uncorrected, and that they should go directly to the main points of the case. The main points of the case were these: The actual figures of the accounts of the Company were before the Court, and the advantage to the appellants—a signal advantage—had been that they were allowed in this case to deal with the figures which were not before the Overseers or the Assessment Committees. But they were not satisfied with the figures of the actual working of the

Company. If they had been prepared to deal with the actual figures which were shown by the Company's accounts, there would, of course, have been no quarrelling on the part of the respondents with the results of such an examination. In dealing with a matter of this kind, the respondents could not ask the Court to discuss whether or not the Company had been wise in the way in which they had carried on their business. He was prepared to accept the Company's practice as indicating the right way of carrying on the business, and to deal with the accounts upon that footing. The matter would have been comparatively simple if they had dealt with the actual figures of the year in question, corrected (if they were corrected at all) by reference to the average which experience would give. But that was by no means the course which the advisers of the Company had taken. With regard to one or two matters of very large importance, he would have to direct attention to a serious discrepancy between the respondents and appellants. He would take one point at once, because it was quite fresh in their memories. In cross-examining Mr. Woodall, he (the Solicitor-General) had endeavoured to indicate the matters upon which they were at serious issue. The first matter he would refer to was the very large question of the allowance for repairs. It was an extremely difficult thing to say how repairs which had actually been borne by the tenant (he being the landlord of the property, and keeping the accounts of the landlord and tenant together) ought to be divided between one party and the other. But he did not know that there would be much controversy with regard to the proper proportion of repairs which would be attributable to the landlord. He did not pledge all his learned friends to the exception of his contention with regard to the matter; but he was not sure that he himself should be inclined to dispute that the assignment of two-thirds of the repairs to the tenant and one-third to the landlord, would be an unreasonable apportionment. As he said, the Company had been doing all the repairs; and the amount which had been expended was known. The respondents said: "Take the actual expenditure." Now they had the expenditure for the particular year in question; and that expenditure, which covered both landlord's and tenant's repairs, amounted to a total of £328,000. This Company had been carrying on business for a long series of years, and had been paying very large dividends—13 per cent. Those dividends had, no doubt, been paid during some years with the assistance of a great reserve fund; still the Company had been conducting a very successful business. Supposing that £328,000 represented what he submitted that it did represent—viz., the proper expenditure upon the whole bulk of repairs—this would be £218,000 chargeable as tenant's repairs. But the Court was asked to apply an artificial figure to this matter. Mr. Woodall said they were to take 4d. as being the amount of charge applicable to the tenant; Mr. Jones said 5d. for the tenant, and 6d. for the landlord and tenant together. In one table put in by Mr. Jones, giving the wear and tear of the appellant Company contrasted with the average of the three Metropolitan Gas Companies, the charge from 1872 to 1889 was stated; and it gave an average of 5·77d. From that figure Mr. Jones obtained his 6d. The respondents submitted that this was a most unreasonable proceeding. For instance, during the year with which they were actually dealing, 4·10d. instead of 6d. was the charge for the whole thing; and in each of the previous two years, it was 3·83d. The case made against the management of the undertaking by the witnesses on the appellants' behalf was that the Company had failed to expend a sum which he thought would be found to represent in figures £100,000 a year, or something of that kind, which they ought to have spent upon the maintenance of the property. He said nothing about the hardship that calculations of this kind imposed upon the representatives of the Overseers and of the Assessment Committees, although it was manifest that it was quite impossible for those who, from the outset, were assessing the value of a great concern like this to do anything but look to see whether or not the place was in good condition, and if it was, to accept the expenditure which had kept it in good condition as being proper. Mr. Jones said he thought it possible that expenditure had not been incurred, but had been held over because of bad years. Still, nobody would say that there was a point at which the works were defective. The actual figures were before the Court; and the respondents claimed to go by them. At all events, they would only recognize as the tenant's expenditure two-thirds of that which was shown by the books. In the matter of law charges, £9690 was the sum put down for them; but, as a matter of fact, £7000 of it was charged for parliamentary proceedings. He was quite unable to see, with regard to proceedings in Parliament for obtaining a Bill, that the tenant would have anything to do with it.

Mr. LITTLER said the charge was not incurred for promoting Bills; it was for opposing them in the interests of the Company. Among others, there was a Bill for authorizing steam-rollers to be used.

The SOLICITOR-GENERAL said the Court could easily decide the point that was raised; and he would leave it in their hands, and would so pass on to the very important matter of the tenant's capital and the allowance thereupon. The respondents would suggest that the tenant's capital had been enormously overrated by the appellants. The occupier's share, as given by Mr. Woodall, was £332,500—viz., 17½ per cent. upon the capital of £1,900,000. He hoped the Court would carefully consider whether it was right, whatever the capital might be, to allow 17½ per cent. on it. Although this question had, to a certain extent, been decided in past times by the concurrent practice of different Courts, he thought it could never be considered to have been so settled as to prevent a Court from exercising its judgment with regard to the matter. He was quite at a loss to understand on what principle 17½ per cent. was insisted upon, as the allowance which should be made upon undertakings of this kind, when it was notorious that the rate of interest obtainable for capital had of late years been very greatly reduced, and that upon some securities it was not now possible for anyone to get the same rate of interest as in times gone by. The 17½ per cent. must be considered in reference to the amount of capital on which it was allowed; because if the advisers of the Company were successful in piling up the tenant's capital to the extent they had done in the present case—to such an extent, in fact, that the tenant would positively be already ensured against all possible risks—they could not ask for so large an allowance as the Court otherwise would have permitted. Among the witnesses who would be called on behalf of the different parishes, there would be diversity of opinion with regard to this matter. Some would take 17½ per cent. on the ground that this was the ascertained amount; but, in making up the tenant's capital, it should always be remembered that there had been the allowance of 2½ per cent. for risks and casualties. This being remembered, the tenant's capital itself ought to be somewhat less in amount than would otherwise be required. The actual practical test of the observations he had been making appeared to him to come out very clearly in the question with regard to the quantity of coal to be allowed to the occupier. What was the allowance claimed by the appellants? They said that the tenant would wish to have 450,000 tons of coal in store, and that he must therefore be allowed a sum representing 450,000 tons of coal at 14s. 8d.—that was to say, about £300,000. But large and, as he should contend, extravagant as that would be, it was not the only allowance made for coal; because, in considering the amount of capital that the tenant would require, the appellants' witnesses began by saying that he needed five-twelfths of the whole expenditure which fell upon him during the year which came to about £1,200,000. This five-twelfths included all the expenditure upon coal, wages, and all the other outgoings of the Company. In the course of the year, the Company paid £1,255,000 for their coal. Five-twelfths of this would be a little more than half-a-million of money; and in that sum there would be an allowance for something like 800,000 tons of coal. So that the result of the figures which had been given to the Court by the representatives of the Company was, that the tenant should be allowed, as capital which he would require on going into this business, £500,000, *plus* £300,000—about £800,000—for coal only. Was that reasonable? One really had not to consider whether or not the tenant was protected against risks and casualties here, because it was perfectly amazing that he should be allowed two-thirds of the whole of the annual expenditure upon coal. The Court knew what was the course of dealing followed by this Company with regard to their supply of coal. Mr. Field had put in a weekly statement, showing for a whole year (from July 11, 1889, to July 3, 1890) the way in which coal came in. Whatever correction or allowance might be made for difference of circumstances in a later year, and for the scare with regard to strikes, of which full use was being made in the conduct of the case on behalf of the appellants, the actual figures were so different from those put forward that he submitted to the Court that they practically destroyed that case. In the weekly statement he did not see any marked difference in the amount of deliveries between July, 1889, and July, 1890. During the latter half of 1889, the stock of coal was rising from 63,000 tons in the month of July to 190,525 tons on the 31st of October; the latter quantity being the highest reached during that half year. The stock was greatly expended in the course of the winter months; and on the 3rd of April, which would mark the time at which the year of assessment would begin, it had been reduced to 56,000 tons. Then it began to rise; and by the 3rd of July it was 272,000 tons. In July, 1890, the Company, with a proper prudence, were arranging to strengthen very much their stock of coal, in view of contingencies which might arise. He did not dispute that they were wise in doing so; but these difficulties did not occur every year. The question now was what the tenant would require to have in hand, in money, on going into the business, in order to enable him to supply the stock of coal. The Court had the record of that year; and the highest quantity then was 272,000 tons, the highest ever reached being in October, 1890, when it rose to 463,000 tons—a stock which had been accumulating, and would be accumulating in future years, during the course of the twelve months, and would practically supply the Company's requirements during the winter season. Under these circumstances, what possible excuse could there be for allowing to the tenant a stock of 800,000 tons of coal, upon the total value of which he was to receive 17½ per cent.—10 per cent. for trade profit upon the stock so put aside, 2½ per cent. for risks and casualties which did not exist, and 5 per cent. interest as well. This, of course, was a very important matter; and the respondents would ask the Court to consider it carefully, as in their opinion a most exaggerated claim was made on behalf of the Company in this respect. The respondents suggested that, while something extra should be allowed in regard to the increased price which undoubtedly the Company had paid, or would have to pay, for coal, no such sum as that which they had asked for in reference to the enormous stock of coals which had been indicated should be given.

The CHAIRMAN: You first of all deny that they require such a large stock; and then you point out how important it is to consider what the stock should actually be when we find that there is practically 17½ per cent. allowance in respect of such (as you say) unnecessarily large stock?

The SOLICITOR-GENERAL said that was his contention. The 17½ per cent. on £300,000 would be between £51,000 and £52,000; and the claim was that the rateable value of the property should be reduced to this extent, because of the purely hypothetical and imaginary requirement of having this stock of coal. Of course, a sum of fifty odd thousand pounds in a year in rateable value was of extreme importance to the different parishes; and therefore they asked for the judgment of the Court upon the matter. He did not propose to go through all the details; but there was a very large item for meters. The case with regard to the meters was a remarkable one. The total value was given at £367,000—a figure arrived at by both Mr. Jones and Mr. Woodall from the list of meters. The respondents did not quarrel with that figure; but how was it dealt with in the appellants' accounts? Mr. Jones took off 25 per cent., and so reduced it to £275,000. But Mr. Woodall only deducted 10 per cent.; and this gave a figure of £333,000 as the amount to be allowed on the tenants' capital. When the representatives of the Company were before the Assessment Committee, they put the value of the metres at £243,000; and this, taking off one-third from their total value, was what the respondents would suggest to be the proper mode of valuation. They were prepared to take the figure the appellants' representatives gave to the Committee as being the value of these meters; and that figure would, of course, make a very large reduction in the sum now claimed for tenant's capital. Mr. Jones had allowed £157,439 for stores; and he had also an item of £170,801 for loose plant. With regard to this, a statement by the Company had also been made to the respondents. It was made as representing a sum of £106,000; but now it reached £170,000. It was, of course, impossible for those who,

as surveyors, were representing the different parishes, to go all over the works of a gigantic undertaking like this, and to come to estimates of value in full detail. There, again, he should urge upon the Court that, where the representatives of the Company gave to the Assessment Committee a sum of £106,000 as representing a particular item, they ought not to be allowed to come and say now that it should be £170,000; and that great weight should be given to the statement the appellants themselves had made for the information of the respondents, when the assessment was being prepared against which the present appeal was made.

Mr. *W. Eve* was then called, and, in reply to Mr. POLAND, said he had valued the works of the Company for the City of London Union and for the Vestries of St. Giles's; St. George's, Bloomsbury; Bethnal Green, and Kensington; St. Mary's, Islington; the Hackney Union and the St. Saviour's Union. He had made a valuation of the whole concern, and contrasted it with Mr. Jones's valuation. He had taken the receipts as given by Mr. Jones, and had adopted that gentleman's total of £3,198,577. In connection with expenditure, he had also accepted Mr. Jones's figures under the heads of "manufacture" and "distribution" for coals, salaries, wages, purification, and meter repairs. With regard to stove fixing and repairs, he did not agree with Mr. Jones's figure of £37,508; he would propose in substitution for it £8216, which was the actual amount the Company received for stove hire. The percentage charged for the hire of stoves was ample for their repair and for interest. The Company at first (he understood they had now ceased to do it) laid the pipes for the stoves free of cost. Through this increased expenditure, the Company obtained an increase in the supply of gas which was not shown in any of the accounts before the Court, as it was an outlay in anticipation of receipts. He thought the figure of £8216 ample to maintain the stoves, except for the extraordinary expenditure which the Company were now incurring in order to get business. He had adopted Mr. Jones's figures for public lamps and rents, rates, and taxes. With regard to management, for Auditors, salaries of Secretary, Accountant, and clerks, Directors' fees, collectors' commission, stationery, printing, and general charges, Mr. Jones's figure was £61,093. Against this he allowed £55,593. He understood that these items included charges for the landlord and the tenant—that was to say, the Company in possession were the landlords, occupying their own property, and they had certain duties to do as hypothetical landlords and certain others as hypothetical tenants. He had tried to eliminate from the Company's expenses those which were applicable to the work done *quâ* landlords. He thought the difference between £55,000 and £61,000 a moderate sum to be allocated to the landlord. The £55,000 was a liberal allowance so far as the tenant was concerned. He had cut out the parliamentary expenses altogether as relating to the landlord, and had simply allowed £2693 for law charges. Then Mr. Jones had put down £18,346 for superannuation. Of that sum, £4921 was payable to officers pensioned in consequence of amalgamations. No doubt the landlord gave less for the undertaking because he had to pay this £4921; but if it had been commuted, and the landlord had paid more for the nndertaking acquired, it would have been capital, and would not then have been imported into the account at all. That was the reason why it should be omitted. In his judgment, the amount allowed for superannuation should be the same in the first as in the fiftieth year of a company's life; and it should be averaged over the period from the birth to the death of the concern, and not be treated as one which must necessarily increase with its age. On that ground, he further reduced to £10,069 the amount for superannuations. Then there was an allowance of £1500 for depreciation. This was a depreciation of leasehold property, and was a very proper deduction to be made by the landlord, but not one to be made by the tenant. With regard to the increased price of gas, it had been proved that on July 1, 1890, the advance in the price of gas took place, so that it must have been resolved upon during the previous half year. The account year ended on June 30, 1890; but the valuation list would not come into operation until April, 1891. He therefore thought it right that the enhanced price of gas which the tenant would get should be taken into account in the value of his property. Mr. Jones had allowed a sum of £209,812. His (witness's) calculation was £211,384; and Mr. Field, in answer to the Solicitor-General, had mentioned £211,000. With regard to wear and tear, he did not agree with Mr. Jones's figure of £47,433; and he put it at £17,036. For the repairs under the head of "manufacture," he took from Mr. Jones the quantity of coal carbonized as being 1,897,479 tons; and ascertained, from Mr. Field's "Analyses" of the various gas companies' accounts, that in 1885 the amount under this head was 3s. 6·83d.; in 1886, 3s. 7·15d.; in 1887, 2s. 5·7d.; in 1888, 2s. 7·35d.; and in 1889, 2s. 8·86d. This gave an average of 2s. 11·97d.; and if that average were multiplied by the number of tons of coal carbonized in the year in question, it would amount to £284,385. The item given by Mr. Jones for these repairs was £276,762; and the difference between the two figures was £7623. Off the latter sum there was to be taken £6000, which the Government Auditor obliged the Company to write off annually for works which had ceased to exist in Curtain Road, and which did not form any part of the rateable hereditament at the present time. That brought down the £7623 to £1623. Then he came to the item of repairs, under the head of "distribution," £52,185. Taking again the 1,897,479 tons at the average under this head for five years—viz., 8·55d.—that would make a total of £67,598. The amount already allowed under that head was £52,185; leaving to be allowed here £15,413, which, added to £1623, gave the total of £17,036. In his judgment, the latter figure was quite sufficient as an allowance for repairs in connection with both manufacture and distribution. He did not allow anything for increase in wages in respect of carbonizing. He believed that the introduction of machinery, and the fact of having reached the top in wages, made it advisable that no further allowance should be made. They must not have a large percentage for capital, and then hedge it round with every security. With regard to increase in wages under the head of purification, he only allowed what the Company actually paid. He adopted Mr. Jones's figure of £91,295 for the extra net cost of coal. He did not agree with Mr. Jones's figure of £1,705,577 for the tenant's capital; he thought that £1,043,077 would be ample. He had taken the working expenses at £2,382,432, and deducted rates and taxes—making £2,226,568. Adding to this latter sum the extra net cost of coal, £91,295, it made £2,317,863, from which he deducted all the repairs he considered should devolve upon the landlord, amounting to £324,199. This brought the sum down to £1,993,664. Upon that he had taken for coals three-eighths—that is, 4½ months—instead of five-twelfths; making £747,624. He thought this was quite ample; it was the proportion he had adopted for a very long time. It gave one complete quarter and six weeks besides. Three-eighths of the total receipts for the residuals (£841,755) would work out to £315,658. Deducting this from the £747,624, there would be a balance of £431,966, to which he added £103,432 for four weeks' consumption of coals, in addition to the 4½ months previously mentioned. In taking the 4½ months, he included 711,680 tons; and in allowing for the four weeks besides, he added 145,000 tons—making a total of 856,680 tons, out of the total consumption for the year. He had prepared a statement in which he had assumed an equal weekly delivery of coals, from which it would appear that the total number of tons carbonized in the year, divided by 52, would produce 36,345 tons. Taking this as the 52nd part of the total consumption for the year, and assuming absolutely even deliveries, if the appellants used, as was the fact according to Mr. Field's statement, 34,400 tons in a week, they would add to stock 1945 tons weekly. He had given them 145,000 tons for the four weeks; so they would therefore have 146,945 tons at the end of the first week, and on reaching the period of October, when it was stated that they would require the most, they would have in stock 451,865 tons. The inference he drew was that the 4½ months and the four weeks which he had allowed prior to the evidence being given in the case were fortified by this calculation, showing that the 145,000 tons would produce the very amount, within a thousand or two, which the Company said they needed in October—viz., 450,000 tons. At the end of June, by allowing what he had done, the Company would have in stock 264,485 tons; while, according to the published accounts of the Company, they really only had last June 200,652 tons. He had taken the figures for coke and tar from the appellants' supplementary case. For stores, £157,439 was given in that case; but this included the stores of the landlord as well as those of the tenant. He had allowed £40,000 for tenant's stores. Then with regard to the loose plant, he had eliminated from the figure of £170,801 all that belonged to the landlord, which the Company, *quâ* tenant, would not have to take; and he estimated the tenant's share at £80,000. Then for three months' rates, and for money in hand, he had allowed £50,000. In regard to meters, he had taken the total value of £367,768, and had deducted one-third instead of Mr. Jones's 25 per cent., or Mr. Woodall's 10 per cent. This made the figures for the meters £245,179. Adding all these amounts together, the tenant's capital was brought up to £1,043,077. On this, instead of 17½ per cent., he had taken 15 per cent. He considered this ample to induce anybody to take these works, with the security by which they were surrounded, and with the capital he had just described. But if the capital were divided, and any part of it were to have the 17½ per cent., then there were, he thought, certain items on a different footing to the others. In the first place, the meters were very slightly removed from being rateable in themselves, and certainly they ought not to have a large percentage. He thought also that the coke in store, and the tar and other residuals, stores, and loose plant, all came under the same category as in railway cases, where it was usual to put a different percentage on stores from that allowed on capital otherwise invested. These items amounted to £457,679, 10 per cent. on which came to £45,768, and 17½ per cent. on the balance to £102,444; making a total of £148,212, as against the £150,000 which he had allowed on the basis of 15 per cent. With an undertaking which was a complete monopoly so far as gas was concerned, he thought this was a very ample return on the tenant's capital. Then in regard to the sinking fund for renewals and ordinary works, Mr. Jones had put in certain figures making together £99,427. He did not agree with him there; and he had allowed £23,500. Mr. Jones, in his evidence, had really claimed that the Company had been neglecting their duty to the extent of £130,000 a year. But he (witness) said that, in his judgment, the works were in good repair; and it was so stated in the reports by the respective officials of the Company, who ought to have a good knowledge of the subject. He had been all over the works, and considered that they had been properly kept up. Of the £23,500, a sum of £20,000 related to the question of repair, and £3500 was for insurance at 3s. 6d. per cent. on £2,000,000. The landlord's share, subject to correction for rates, according to Mr. Jones, was £413,221; but according to witness's figures, it would be £762,734. Mr. Jones gave the total rateable value of the whole concern as £452,253; but witness put it at £720,888. Mr. Jones had taken as the value of the indirectly productive works £282,370 as being 5 per cent. upon a structural value of £5,647,359. Against this he put £220,000. In estimating the structural value, he had adopted the division indicated on the Company's own map—viz., the division into high-pressure and low-pressure mains. It was very difficult to say how the division should be made. It seemed to him that there was no stopping-point. It was not like water, where the pressure was always on. In the case of water supply, they had certain pipes which were constantly in use, and subsidiary ones which were used periodically, except where there was constant supply; so that there was an opportunity of making some division. But with regard to gas, as it was practically always in the pipes, there seemed to be no division whatever of a satisfactory character, other than this one of high pressure and low pressure. Assuming that this was a proper division, he had valued the high-pressure mains at £398,127, and had called 5 per cent. on that £20,000. The rateable value of the rest was £195,867—say, £200,000. These figures brought out, as Mr. Jones's rateable value for the directly productive portion, £169,883; the corresponding figure in witness's valuation being £500,888. To this latter sum witness added "estimated receipts arising from a further increase of 3d. per 1000 cubic feet, which doubtless would have been made had not the Company had funds in hand to enable them to pay the maximum dividends, £211,384"—that is to say, taking the increased price of gas at 6d., instead of at the actual increase by the Company of 3d. If this was a proper sum to allow, it increased his £500,888 to £712,272. In his opinion, this was a proper valuation. He had not taken any addition in respect of the augmented output; but it was stated in one of Mr. Field's tables that the increase of 3d. per 1000 cubic feet for the year ending June,

1891, was £224,501, whereas he had only taken into account £211,384. He had assumed that the increased consumption of gas which occurred after the 3d. was added might all be swept away, when the price was raised 6d., by a diminished consumption. Even if this increase were swept away, he still submitted that the £211,000 would be obtained; the fact being that, when they first raised the price 3d., it would produce £211,000. As a matter of fact, for the year ending 1891 it did produce £224,000; the difference of £13,000 being due to additional consumption. Therefore, if the effect of increasing the price a further 3d. did reduce the consumption, there was this margin of £13,000 left before the Company sustained any loss therefrom.

The inquiry was then adjourned till the following day.

MISCELLANEOUS NEWS.

BIRMINGHAM CORPORATION GAS UNDERTAKING.

In the course of a lecture delivered by Mr. Parkes, a member of the Birmingham City Council, at the Ladywood Conservative Club last Wednesday, some interesting particulars were given concerning the Corporation Gas Undertaking. The lecturer first described the process of manufacturing gas, and then stated that the Gas Committee had adopted a new system of purification, so as to remove, as far as possible, the sulphur compounds from the gas. The process would be more expensive than the old system; but it was adopted in the interest of the consumers principally, because the gas would be purer and more beneficial to health. By their Act of Parliament the illuminating power required for the gas in Birmingham was 15 candles; but it was equal, on an average, to nearly 17 candles. The gas was supplied to 55,000 consumers, extending over an area of 17 miles by 10 miles. There were 540 miles of mains; and 415 miles of public roads were lighted by 12,200 street lamps. The sale of gas in 1875, in the time of the old Company, was 2120 million cubic feet per annum; but in 1890, it was 3770 million cubic feet. Notwithstanding the development of the undertaking, however, the capital practically stood at the same amount as when the undertaking was acquired by the Corporation. The "penny-in-the-slot" system of supplying gas t othe artisans' dwellings in Ryder Street had been a great success; and an extension of the system was contemplated by the Committee. Out of the profits since the undertaking was acquired by the Corporation, the Committee had built up a reserve fund of £100,000, together with a sinking fund of above £300,000. A sum of £400,000 had been applied to the improvement rate; £62,000 had gone to assist in the cost of public lighting; the expenditure on the new offices and the Art Gallery had been defrayed; and, in addition, the present price of gas showed a reduction of 11d. per 1000 cubic feet as compared with 1875, representing a total reduction of £1,600,000. The adoption of the eight-hour system had increased the expenses of the Committee by from £1400 to £1500 a year, whereas during the last three years, the increased cost of the official staff had only been about £800 per annum; and considering the extra quantity of gas produced in the three years, the proportionate cost was really less than in 1888. The increased cost of coal had caused some of the large gas companies to increase the price of gas to the consumer—notably in London, Dublin, and Edinburgh, by 3d. per 1000 cubic feet; at Barnsley, by 4d.; and Bristol, by 5d. But in Birmingham there had been no increase, though last year the net increase in expenditure caused by the rise in the price of coal and in wages amounted to £80,000. A vote of thanks was accorded to Mr. Parkes at the close of his lecture.

MODERN VENTILATION.

A Lecture on the above subject was recently delivered in the Free Library, Liverpool, before the Association of Public Sanitary Inspectors of Great Britain, by Mr. J. F. Simmance.

The lecturer began by saying that, with an audience composed exclusively of Past-Masters in Scientific Sanitation, he was relieved of the necessity of introducing his subject with arguments as to its importance. He did not think, however, that the opinions of many of them would coincide, if they were required to define good ventilation; but apparently the point of perfection would be attained if houses were filled with air precisely similar, in its percentage of injurious matter, to the external atmosphere—varying the temperature to suit different people's ideas of comfort. This might appear to be a simple matter; but, unfortunately, not only had different people different ideas of comfort, but doctors themselves disagreed as to what change of air in a room would constitute efficient ventilation. He then proceeded to indicate the most usual methods of ventilating buildings; considering their advantages and disadvantages, and gathering therefrom materials for the delineation of a system which would, as far as possible, obviate all the objections. He said the first essential of a system of ventilation is that it shall not produce discomfort by causing a feeling of cold; then it should be under complete control; and, lastly, it must be cheap, and of such a nature as to admit of its application to existing buildings—whether cottages or palaces—without necessitating any radical alterations. It must be simple, so that inexperienced persons could understand it; and scientific, so that accepted philosophical formula might enable success or failure to be reasoned out on paper. If a system complies with these requisites, and yet effects a complete change in the atmosphere of a building—so thorough that no person is under the obligation of inhaling products of previous respiration—it may be looked upon as perfect; and the nearer it approaches this perfection, the more worthy it is of adoption by those who are responsible for controlling new buildings, either for their owners or on behalf of local authorities.

Mr. Simmance then went on to show that systems of ventilation may be divided into two classes—viz., propulsion and extraction systems; one tending to increase density, and the other to reduce it. The most usual method of effecting ventilation is to utilize the extractive action of the wind upon the upper extremities of shafts or flues; and there is little doubt, he remarked, that the open tube, with the wind at a given angle, produces the greatest extracting effect. But wind inclining towards the earth, at however small an angle, will entirely prevent the open tube from being an outlet; while ingeniously constructed cowls would scarcely be at all adversely affected. Having alluded to the various cowls in use, he said the one which seemed to him to approach nearest to the conditions of the open tube, without its disadvantages, is that invented by Mr. W. Sugg, in which the top of the flue is enlarged and covered with a flat plate wherein are set numerous small tubes. A flat cap fixed about an inch above these outlets could easily be of such an area that the downward angle of obliquity at which any current of wind could possibly enter, must necessarily be very acute—in fact, practically *nil*. Thus the extractive power of the open tube is very nearly obtained without the difficulties of "down-blow." Putting aside, however, all question as to the kind of cowl to be used, it is certain that, with a wind movement, adequate ventilation may be obtained; but it fails in all the essential points except one. If the wind exceeds a moderate breeze, the extraction is too rapid—producing disagreeable draughts; and it is only kept under control by the partial or entire closing of the inlets and outlets. Persons in a room ventilated by means of extracting cowls are at the mercy of every variation of the wind. In Mr. Simmance's opinion, the system of ventilation for future use is not one that is dependent upon the whims of the wind; and therefore a force more reliable and controllable must be looked for. Having discussed the propulsion method of ventilating, the lecturer said that, upon the whole, it appeared to him to be imperfect and undesirable, as, besides the difficulties attending the maintenance of pressure, it was no cheaper than using the necessary fan and engine for extraction. He looked upon ventilation by extraction—using a fan worked by a gas-engine—as one of the best methods, under certain conditions; and he expressed the belief that it would gradually come more into use. To his mind, however, it was not a popular system—one suitable, as he had put it, alike for the cottage or the palace. The plan he advocated was the very old one of the utilization of heat for purposes of ventilation. He cited examples in Nature to show that heat is the only natural way of effecting atmospheric movements; and its direct application, as opposed to its use through mechanical media, was, he maintained, the most efficient and most economical mode of ventilating. Having described the various ways in which heat has been thus employed, he stated that, although they were all based upon one theory, they did not all comply with the conditions he had laid down as requisite for a practicable system to be used under all circumstances. They were not cheap, and although controllable by closing outlets, &c., they could never be generally adopted for small dwelling-houses, as they all required constant attention.

He then proceeded to describe the system he advocated, as follows: There is another way of applying heat to ventilation—cheap, automatic, and suitable for all classes of buildings—and that is to utilize the heat of gas lighting. Gas is now so general that we may consider it almost universal; but in country places, where petroleum is the only means of lighting, my remarks may be deemed to apply equally to it. I am able to say definitely that the amount of gas (whether from coal or from petroleum) which will light a room adequately, will ventilate it adequately; only the system must be a good one. If it is to be successful, there must be no rule-of-thumb work; but to install it properly is no more expensive than to fit it up in a manner that will ensure failure. It is a matter which has received little attention; and, for want of such attention, it has been relegated to the background. The difficulties in the way have appeared insurmountable; and many architects, after considering, and perhaps trying, the system, have become doubtful. The installation has been expensive, as flues have had to be bedded in non-conducting material to prevent danger; and it meant pulling a building to pieces, if it was not being lighted *de novo*. Then the lights wore out, required new burners, cleaning, and were generally rather inaccessible. The difficulty of preventing down-draught, too, was great; and to overcome this, the flues had to be carried in a serpentine way round the building and up the roof until the flue top could look triumphantly down; all the neighbouring chimney-pots. This generally stopped a blow down, but just as certainly stopped any draught up. All the heat of combustion was absorbed by the shafting before it had gone many feet, possibly condensed, and in that case dropped in water, and spoiled the ceilings and tempers of people below. Ventilating by gas lighting was looked upon as a nuisance; and extravagant pendants, fitted with fishtail burners which blackened the ceilings and also the reputation of gas lighting, were, and are to a large extent, looked upon as the most scientific and useful way of using gas. But all the faults I have named are non-existent in a properly-arranged system; the installation is cheap, and the results in lighting and ventilation are most satisfactory. The ceilings and decorations are preserved; and architects can, by selecting such a system, ensure those two *desiderata*—good light and good air—without which no building can retain the admiration of the public.

A ventilating gas-light must be without glass or breakable material if fixed at such a height as not to be accessible at all times, and must be easily lighted from below. It must be shadowless, and be susceptible of being reduced in power to such an extent as to give off a heat of not more than 100° Fahr. at 6 inches above the point of ignition; and it must be capable of being increased until its full power causes an intake sufficient to fill the room with fresh air in 10 minutes. The shafting from the light must be such that its external heat is practically *nil*; while the internal temperature must be very high. Its outlet must not disfigure the building, and must be arranged so as not only to prevent a blow down but a suck down, or that great enemy, an external compression. These features (which are quite indispensable) can be arranged by the aid of recent inventions; and, indeed, all the previously conceived objections to ventilation by gas may be obviated. The light which I have found to answer best is the vertical flame system of Mr. W. Sugg. In this system burners of steatite—that extraordinary material which, soft as meerschaum naturally, attains a maximum hardness when heated to the melting point of cast-iron—are

adopted. It is non-conducting, and practically everlasting; non-corrodible, and unalterable in dimensions by heat or cold. A cluster of such burners up to the required greatest power, are placed immediately below the mouth of an extracting shaft communicating direct with the open air either perpendicularly or horizontally.

You will probably, and naturally, think that a flame burning vertically close to the ceiling wastes the greater part of its light upon the cornice of the room; but it is not so. The experiments made by Mr. W. J. Dibdin, F.I.C., F.C.S., the Chemist to the London County Council, prove this conclusively. He found, and stated before the Society of Arts, that the angle of 45° to the vertical of the flame under test gave the greatest result in light. In the ingenious ventilating light of which I speak, the downward rays at that angle cover the outer area, while the upward-angle rays are returned to the spot immediately below the light by an enamelled iron reflector. Thus a result in light of great brilliancy and economy is obtained. The heat of combustion, being enormous immediately over the flame, ascends through the aperture provided, and travels along the shaft. This shaft is lined throughout with asbestos felt. This absolutely prevents any condensation (which occurs when the products of combustion touch the bare tube, and which is not at all prevented by covering the outside thereof), and not only so, but utilizes a great principle in ventilating—viz., the conservation of heat. Not only is the outer case kept cool, but the tube inside is kept hot; and whether the shaft is horizontal or vertical, the heat is sustained with little loss through its length. At a suitable point, communication is restored between the inner hot shaft and a tertiary flue or casing, which opens into the room round the ventilating light; and with the impetus gathered from its travels, the inner cone of hot air rushes out, causing an aspiration in the outer air-tube equal to the action of a gale of wind at a convenient angle upon an open tube. Thus, by aspiration and expansion, air is drawn from the room in quantities controllable by simply turning a tap, and the output is varied from 15,000 to 300,000 cubic feet per hour; for a foot of gas in such an apparatus as I have described will extract nearly 3000 times its own volume of air.

The question of back-draught or down-draught is one which will occur to many of you; and it is an important one. We can stop with a cowl a blow down; but what cowl will stop air from passing down it, if sucked into the room by some force greater than the wind's action on the cowl. If a fire is burning at the foot of a tall chimney, the outlet of which is higher than the cowl, how can we prevent the fire drawing its air supply from this convenient cowl-protected inlet in the roof. As I have already said, no cowl of itself can stop it. But in the ventilating light scheme, the difficulty is surmounted by inserting in the cowl a disc of talc or similar material, which is perfectly flat, and rests upon the end of the shaft, which, being carefully and squarely cut to meet it, makes a sound joint, air-tight against any external air. The disc is threaded on a central pin, and is attached in no other manner; nor can it become rigid in any way. The theory of this valve is bound up with that of the non-conducting lining. Each is, to some extent, imperfect without the other; but together they utilize that power, which has, I think, never before been brought to bear upon ventilating lights. That is the conservation of heat already mentioned. You are aware of the rule which makes hot air ascend. It is simply pushed up by the weight of cooler air descending: and the impulsive force of heated air is according to the degree to which it varies from air at normal temperature. I will take as an instance a column of air 1 foot square by 20 feet high. This weighs about 1·6144 lbs. What keeps this column of air from rising is the fact that neighbouring columns of air of similar dimensions are at the same temperature. We will consider such a column of air as being contained by a non-conducting shaft 20 feet long by 1 foot square. This we will presume to be subjected to heat; but before applying the heat, suppose we close the top of the column with a flat plate of no weight, and on this place shot of known weights. When the heat is started, the air in the column expands; and at first the surplus contents flow out at the unclosed end. The hottest air rises up the shaft to the top, under the plate, upon which a pressure is exerted equal to the difference in weight between the heated air in the column and a similarly sized column of unheated air. If our column of heated air is at 480° Fahr., we have doubled its volume, halved its density, and obtained an upward pressure of half its weight; that being the difference between the heated column and an imaginary cool column. So that, if the plate is weighted to 0·7 lb., the upward force will still lift it; and if a down-draught presses upon it to any extent less than the upward impulse, the plate will still be lifted, and the exit take place in spite of the down draught. This plate is represented in our ventilating scheme by the exit-valve—the disc. We will suppose an external compression of the atmosphere to exist, which holds this disc valve tightly on its seat; then the heated products from the ventilating light fill the tube right up to the valve; and, losing very little heat by the absorption of the shaft, continue to become hotter until the upward pressure exceeds that of the downward pressure, forces it back, and makes exit. Should this pressure be severe, as long as it does not exceed 0·8 or 0·9 lb. per square foot, the conservation of heat soon reaching 400° or 500° will cause an exit to be forced. Thus a down-pull on a ventilating outlet may be overcome, and with these inventions ventilating exits may be made in places hitherto impracticable. But we have another assistant in this matter. The exit-valve spoken of is placed in one of the powerful Sugg cowls before mentioned; so that not only does the light cause extraction, but the cowl does its work when no light is going. Its working is such that the mere passing of a wind across it will cause extraction, and keep the valve balanced in the current until a cessation in the upward current, and the consequent threatening of a down-draught, will restore it to its seat. But you will say, with reason, that such a cowl extractor, with a heavy wind, will cause undue ventilation. By a simple mechanical arrangement, the exit-valve is, in exposed situations, made to act as a regulator, which allows a free outlet so long as the fixed output is not exceeded, but under a violent extraction closes the orifice in proportion to the increased suction—thus keeping the output regular and unaltered. For about two years some of these have been in work, and have never failed; nor can any traces of wear or disorder be perceived. They are apparently as good as ever, although exposed to the full heat of ventilating lights (in one case within 3 feet of the flames). As regards the efficiency of this system of gas ventilation, I examined recently an installation at the Grosvenor Museum, Chester whence unventilated lights had been removed. In this case the Committee, sitting under the presidency of the Duke of Westminster and the chairmanship of Sir Horatio Lloyd, had carried out extended experiments in the rooms of the Technical Education Department, and authorized the Honorary Secretary (Mr. J. R. Griffiths, of Chester) to give a certificate to the effect that the temperature of the rooms did not rise 1° with the rooms full of students and after hours of work. The lighting was characterized as being perfect.

The question of air-inlets must be answered; but I should hesitate to advocate the arrangement of a greater area of inlet than outlet, unless circumstances precluded the ample distribution of the inlet orifices. A plan I have lately recommended is, I think, as good as any. In this case the grounds of the skirting were cut through, and the board itself perforated in an ornamental manner at intervals. The floor boards should be cut short, so as to allow free way from between the joists to the space behind the skirting. In the outer wall of the room, air bricks are set; and from each of these a light zinc shaft runs to the centre of the floor between the joists, terminating at an open end. Thus the suction above is exercised equally all round the room, and the incoming air is fairly well modified in temperature. In an existing building the inlets must depend upon circumstances; but distribution must be the point considered. With control of the light you have control of the inlets; and the whole matter may in this way be regulated.

There does not appear to be one of the conditions I have put forward with which ventilation by gas lighting does not comply, if carried out as I have described. It is cheap, if put in when the building is in course of erection; the light itself being the only item of cost worth considering. It can be fixed almost anywhere, and can be made to work well. At one stroke, lighting and ventilation are accomplished; and you have the best of both. There is no advantage claimed for electricity which is not possessed by gas so used—cleanliness, coolness, and efficiency; and comparison does not exist upon the point of cost. Every small house could, while building, be fitted with the shafting—leaving the tenant to select his light; and this he could buy at as little cost as a gaselier. Finished houses can be ventilated without pulling them to pieces; and the parts of the system which would be considered fixtures, and therefore not removable, are the cheapest parts of the installation. The lights may be from 16 to 2000 candle power; and they will last for years. There is no danger in their use; and gas explosions from sliding and other imperfect chandeliers are abolished. You only pay for gas (and not so much as you would pay for a less scientific system), and you get ventilation into the bargain; while you have an ever-ready mechanical force which will at any time educt vitiated air from the room by the simple means of a lighted match and a turned tap. Ventilation by gas is emphatically the method for large or small buildings or shops, and for all situations where persons have a regard for their health, for their eyesight, for the cleanly appearance of their ceilings and walls, and for their pockets.

Georgetown (British Guiana) Gas Company, Limited.—The Directors of this Company have issued their report and statement of accounts for the half year ending June 30 last. The latter shows that the gas and meter rental amounted to £3880; and that the residual products, fittings, &c., produced £740—making together £4620. The total expenditure came to £3519. The profit for the half year is, therefore, £1101, which, added to the balance brought forward, makes £2925; and, after paying the dividends to Dec. 31, 1890, and the interest on debentures to June 30, 1891, there remains an available balance of £1643, out of which the Directors recommend the declaration of a dividend for the half year, on the preference share capital at the rate of 8 per cent. per annum, and on the ordinary share capital at the rate of 7 per cent. per annum, both less income-tax (except upon those dividends payable to the local shareholders), which will leave a sum of £476 to be carried forward to the next account. The report announces that the Board have appointed Mr. G. R. Garnett, of Georgetown, a Director of the Company, in the place of the late Mr. R. P. Drysdale.

The Gas Question in the Salford Out-Townships.—The Eccles Board yesterday week had another discussion on the question on erecting gas-works for the supply of the district; but they did not make any progress in the matter. The Clerk first submitted a report on the action taken by the Local Board since 1874—when they sought to promote a Bill to make their own gas—up to the present year, when a clause was inserted in the Salford Provisional Order giving Eccles and Swinton the option of making and supplying their respective districts with gas. He had received several offers of sites for gas-works for Eccles; and he suggested that these offers should be discussed in Committee. Alderman Mather contended that it was a waste of time discussing the gas question until the ratepayers had been consulted. He objected to the Board sitting *in camera*; and in his opinion they were acting illegally. The Clerk said it was necessary that the Board should determine that night whether or not they would promote a Bill in the coming session. If the majority decided against the proposal, then they would have to give early notice to Swinton. At this stage a deputation presented a petition signed by 199 ratepayers, requesting the Board to call a public meeting of the ratepayers to repudiate or confirm the action of the Gas Committee. Alderman Mather, in introducing the deputation, said the Board had that evening decided to incur an expenditure of £6000 in the purchase of a site for the proposed gas-works. There was the strongest objection on the part of the ratepayers generally to the Board dealing with the matter at all; and the petitioners sought to prevent the Board incurring any further expenditure on the scheme. After the deputation had withdrawn, it was agreed that the Solicitors to the Joint Gas Committee should be requested to call a statutory meeting of he ratepayers on the gas question as early as convenient. The Clerk, in reply to Alderman Mather, said that a debt of £1177 had been incurred by Swinton and Eccles law expenses in connection with the gas question.

METROPOLIS WATER SUPPLY.

The Quality of the Water in September.

The returns furnished to the Registrar-General by the London Water Companies as to the water supply of the Metropolis during the past month, show that the average daily supply was 188,148,177 gallons, as compared with 184,412,177 gallons in the corresponding month of 1890; being at the rate of 31 gallons per head of the population. Of the entire bulk of water sent out, 94,336,192 gallons were drawn from the Thames, and 93,811,985 gallons from the Lea and other sources. Reporting upon the quality of the supply, Dr. E. Frankland said: "Taking the average amount of organic impurity contained in a given volume of the Kent Company's water during the nine years ending December, 1876, as unity, the proportional amount contained in an equal volume of water supplied by each of the Metropolitan Water Companies and by the Tottenham Local Board of Health was: Kent, 0·7; Tottenham, 1·3; Colne Valley, 1·4; New River and East London (deep-well), 1·6; Chelsea, 2·7; West Middlesex, 3·5; East London (river supply), 3·9; Southwark, 4·1; Grand Junction, 4·2; and Lambeth, 4·8. The water abstracted from the Thames by the Chelsea, West Middlesex, Southwark, Grand Junction, and Lambeth Companies suffered considerable deterioration in consequence of the flooded state of the river. The supply of the Chelsea Company was least affected; but the organic matter in the water sent out by the Southwark, Grand Junction, and Lambeth Companies exhibited an increase of upwards of 50 per cent. upon the proportions noted last month. All these waters were, however, efficiently filtered before delivery. The water taken chiefly from the Lea by the New River Company again took rank with the deep-well waters in respect of freedom from organic matter; while the water supplied from the same source by the East London Company was about equal to the mean of the Thames supplies. Both Companies delivered efficiently filtered water. The deep-well waters of the Kent, Colne Valley, and East London Companies, and of the Tottenham Local Board of Health, were all of good quality for dietetic use; and the Colne Valley Company's water, having been softened before delivery, was rendered suitable for washing. All these waters were clear and bright without filtration. Seen through a stratum 2 feet deep, the Kent, Colne Valley, and Tottenham waters were clear and colourless; the New River and East London (deep-well) waters, clear and nearly colourless; the Chelsea and West Middlesex, clear and very pale yellow; and the remaining waters, clear and pale yellow. The bacteriological examination by Dr. Koch's process of gelatine plate culture gave the following results: One cubic centimetre of each water collected in sterilized vacuous tubes, on the same days as the samples for chemical analysis, developed the following numbers of colonies of microbes: New River and Kent, 12; Lambeth, 24; Grand Junction, 26; West Middlesex, 38; East London (river supply), 58; Southwark, 70; and Chelsea, 88."

Messrs. Crookes, Odling, and Tidy, in their report for the past month on the composition and quality of samples taken daily of the water supplied to London, say: "Of the 181 samples examined, all were found to be clear, bright, and efficiently filtered, excepting one which was recorded as 'very slightly turbid.' The satisfactory condition of the water supply to the Metropolis, recorded now for several consecutive months, continued to be maintained during the month of September, although, indeed, the individual results obtained exhibited a somewhat greater degree of variation than has been noticeable for some time previously. Thus in the case of the Thames-derived supply, the mean proportion of organic carbon was found to be 0·129 part in 100,000 parts of the water, with a maximum of 0·150 part in any single sample examined; while the mean amount of oxygen absorbed was found to be 0·076 grain per gallon of water, with a maximum of 0·145 grain in any single sample examined. The highest results were afforded by the examinations made during the middle of the month; and the figures resulting from the separate modes of examination were less closely parallel than usual—those expressing the amounts of oxygen absorbed agreeing best with the determinations of the colour-tint of the water."

LIVERPOOL CORPORATION WATER SUPPLY.

An interesting statement was made last Tuesday by the Chairman of the Liverpool Corporation Water Committee (Mr. Alderman John Hughes), at the final meeting of that body for the present municipal year. Having remarked that he thought, with all the differences, of opinion which existed, their Engineer (Mr. G. F. Deacon) was entitled to their special recognition for so effectually carrying out work which he believed would advance the interests of Liverpool, Alderman Hughes referred to the difficulties which had been experienced in driving the tunnel under the Mersey, and then proceeded to say that the quantity of water distributed during the summer had been on the average from 130 to 140 million gallons per week, and it had reached as high as 144 million gallons. It must be remembered that they were supplying something like 750,000 people. The area over which they had distributing-mains was nearly 90 square miles; and during the past year, they had laid about 13 miles of new mains in new streets and existing roads. Then there was a difficulty which, of course, they had to consider, and which had deprived them of water—that was, the yield of the wells. In 1883, under the advice of their present Engineer, certain improvements were effected, which increased the yield of the wells to 51,500,000 gallons per week; this being the largest quantity ever raised from the Liverpool wells. This had now fallen to 43,200,000 gallons, so that they had a deficiency of 8,300,000 gallons. This diminution was due to a variety of causes. One cause was the stoppage of a borehole at Bootle. The attention of the Engineer was called to this, and after making an examination and going into the matter thoroughly, he came to the conclusion that the quality of the water was not such as could be distributed. Therefore they had lost the benefit of that water. There had also been a large increase in the consumption of water for shipping—that was to say, from 48 to 56 million gallons per annum. The general consumption by meter for trading and other purposes had increased to 3,600,000 gallons per week. When they looked at their ordinary expenditure, they found that in 1885 it was £84,273, whereas in 1889 the working expenses on the ordinary account, exclusive of interest, were £79,527, and last year they were £72,472; so that a reduction was effected of something like £7057. This was very gratifying; and it appeared to him that, as the administrators of the water estate, they had nothing to fear. They had, he thought, done their duty efficiently, both by keeping down the expenditure and seeing that the water was kept up to the proper standpoint. Of course, there were the unfortunate proceedings with regard to the late contractor. He (Alderman Hughes) attended the meetings and had the opportunity of hearing and of considering a great part of the evidence given by the various witnesses; and he certainly could not help but express his strong opinion at the result, which was never anticipated. He could not make out how two gentlemen could have made such an award as they did against the Corporation. He concluded by saying that, whatever their views might be, he hoped it would be the pleasure of the Water Committee to work harmoniously together; and he trusted the day was not far distant when the great work across the Mersey would be effectually and efficiently carried through.

THE WATER SUPPLY OF SWANSEA.

Projected Additional Works.

At the Monthly Meeting of the Swansea County Council last Wednesday—the Mayor (Sir J. Llewelyn) presiding—the Water Committee reported that they had discussed the question of increasing the present water supply of the borough; and the proposed Llwchwr Spring and Cray schemes were fully considered. The Chairman informed the Committee of the result of the conference with the Parliamentary Agents of the Corporation, and pointed out the difficulties in the way of abstracting water from the Llwchwr Spring. The Committee being now unanimously in favour of the Cray scheme, and being satisfied as to the urgent needs of the borough as regards water supply, recommended that a Bill be promoted in the next session of Parliament, enabling the Corporation to construct a reservoir in the Cray Valley, and to utilize the water of the River Cray for the supply of the borough, and that the Town Clerk and Borough Engineer be authorized to take all necessary steps to enable a Bill to be promoted accordingly. The Council discussed the question in committee for about an hour, and on the Committee again resolving itself into the Council, the recommendation was unanimously carried, on the motion of Alderman Monger, seconded by Mr. Tutton.

Commenting upon this matter, in last Thursday's issue, the *South Wales Daily News* says: "The Swansea County Council are seriously considering the necessity for seeking powers to improve the existing water supply. After spending hundreds of thousands of pounds on the construction of three reservoirs in the Lliw Valley, the Corporation are faced by the fact, at the very eve of the opening of the reservoir last erected, that the gathering-ground is such that the water supply can be at the best equal only to ordinary circumstances with the present population, and that a fresh source of supply is an immediate and an imperative necessity. Unknown even to many members of the Council, the members of the Water and Sewer Committee of the Corporation have, during the past month or two, been making serious enquiries as to the resources of a source of supply hitherto unthought of; and now at yesterday's meeting of the Council, the schemes previously discussed—the tinkering of the old reservoir, the adoption of the Cennen, the Llwchwr Spring, and the Blaentawe sources—are thrown aside, and one in the Cray Valley is recommended for adoption. Cray is at the watershed of the River Usk, and is situated about 23 miles up the Swansea Valley. There are about 3000 acres of moorland and only four houses in the watershed; the proposed site of a reservoir, to hold 950 million gallons of water, is on the red sandstone; the supply to the town would be 5½ million gallons a day; the water of excellent quality; and the pressure such that the highest points of the town could be reached with ease, and plenty of power left for hydraulic works, motors &c. The source is strongly recommended. There are few present difficulties in the way of acquiring the necessary parliamentary powers; and the flow is tremendous, varying from 43 million gallons a day in August to 183 million gallons a day in September. The cost would be from £210,000 to £230,000. The Council, after considering in committee the scheme of the Water Committee, resolved that the necessary steps should be taken to get parliamentary sanction for the scheme. This course does not necessarily imply that a reservoir must be constructed at Cray. It means, while even London is considering this source, that Swansea can get the necessary powers for its construction; but if eventually it is found, after more consideration, that the source is not what it is at present considered to be, no expense need be incurred beyond the cost of going before Parliament. The Council is now taking time by the forelock in meeting a great emergency."

Sale of Shares.—Fifty £10 shares (£5 10s. paid) in the *Whitby Gas Company* were sold locally by auction last Thursday at from £8 4s. to £8 6s. each.

Ceara Gas Company, Limited.—In the report to be presented at the annual general meeting of this Company next Friday, it is stated that the profit for the twelve months ending June 30 last was £4072, which is increased to £4647 by the addition of £575 brought forward. Deducting the interim dividend paid in April last there remains the sum of £3027 available for division. The Directors recommend the addition of £500 to the reserve fund, and the payment of a dividend for the six months ended June 30 last of 5 per cent. on both preference and ordinary shares (that on the ordinary shares free of income-tax); making 10 per cent. on the former, and 9 per cent. on the latter for the year. The balance carried forward will be £549. There was an increase of £1095 in the gas-rental last year—a fact which the Directors regard as very satisfactory. Owing to the death of Mr. R. King, the Company were deprived of their Auditor. The accounts to be presented next Friday have been certified by Mr. Magnus Ohren, who is a candidate for the vacant office.

NOTES FROM SCOTLAND.

From our Edinburgh Correspondent.

EDINBURGH, *Saturday*.

We were told in Edinburgh in the days preceding the gas transfer, that by it a saving would be effected in the matter of the opening up of the streets. It was said that all the departments—the roads, the gas, and the water—being under Corporation management, the one would notify the other when it was about to execute works upon any particular thoroughfare; and in that way the city would be saved the cost, not to speak of the annoyance, of having newly-paved streets torn up for the laying of gas or water pipes. This expectation does not seem to be yet realized. Only a few months ago the thoroughfare of George Street, which had been newly laid with causeway, had its surface torn up for half-a-mile to allow of the laying of a new gas-main, at which there was a good deal of grumbling. Complaint is now made with reference to Broughton Street, which, after having been but recently re-causewayed, has been opened in a number of places by the workmen of the Gas Commissioners. The subject was before the Streets and Buildings Committee of the Town Council yesterday, when the statement was made that the Gas Commissioners get a month's notice before any street is to be relaid; but that they are in the habit of leaving any work which they require to do over until after the Roads Department have completed theirs. It was also stated that such conduct on the part of the Gas Commissioners and Water Trust cost the city £3000 a year. This raises the question into one of sufficient magnitude to be worthy of attention. There can be no doubt that whenever the Gas Commissioners or the Water Trust open up a street it is because they cannot help themselves. Such work is not done wantonly. How, then, does it happen that these grounds for complaint arise? In the first place, a month's notice is ridiculously short. The Gas Commission only meets once a month; and there is no time to consider the condition of the mains in a street, get the sanction of the Commissioners, take in estimates, and have the work done within a month. Owners of private streets get six months' notice to put them into good order; and as re-causewaying is not usually a matter of urgency, the notices by the Roads Department might well be extended to that time. There is another reason, which throws whatever blame there may be for lax management upon the Corporations themselves, and removes it from the shoulders of their officials. They are averse to spending money until it can no longer be avoided. Thus, when George Street was re-laid a year ago, they must, or ought have known that the gas-mains in the west end of the city were altogether inadequate for the greatly increased flow of gas which they had to carry; but they could not bring themselves to sanction the laying of new mains until it became a positive necessity to do so. It thus happens that it is on account of the defective regulations of the Corporations and their blundering timidity, that the ratepayers of the city are mulcted in a sum of £3000 a year, which might easily be to a large extent saved.

Tain is one of the towns in Scotland which are on the "down grade." It probably suffers from the depopulation of the Highlands, which leads to a diminution in the number of tradespeople who find an occupation in the local towns; or from some other causes of decline which do not need to be inquired into here. Certain it is that the local gas undertaking, which was once prosperous, has fallen into decay. In the summer of last year, the Gas Company intimated their inability, on account of the condition of their works, to supply gas for public lighting; and this led to the streets being lighted by paraffin lamps. At the same time negotiations were started with a view to the taking over of the undertaking by the burgh; but they came to nothing. The Town Council offered to take over the Company for a payment of £1 10s. per share, or at a valuation; but their offer was declined by the Company. At the end of another twelvemonth, the Company is in a worse position than it was then. In the year prior to October last, it made a deficit of £65; last year, as reported to the shareholders at their annual meeting on Wednesday, there was a deficit of £97 10s. In these circumstances, it was agreed that the undertaking should be offered to the burgh at a valuation. The Town Council are, it is understood, not averse to the transfer.

The Police Commissioners of Inverness having consulted two engineers on the subject of whether it would be possible to obtain water power for an electric lighting scheme, have been informed by these gentlemen that there is a point in the Caledonian Canal where they could get water which would produce 400-horse power. The scheme of gas extension which was proposed, and which drove the Commissioners to think of electric lighting, was estimated to cost £10,000. As yet no estimate has been given of the cost of an electric lighting installation; but it is likely that this aspect of the question will be thoroughly looked into before a decision is come to. The question is an interesting one, as it raises a direct issue upon whether gas or electricity is the cheaper lighting medium—and that, too, in a place where gas is at a disadvantage, in respect of the distance of the locality from all sources of supply, and where electricity would have a decided advantage over what it is possible it could have in any of the large towns, in respect of the trifling outlay the water power would entail.

From our Glasgow Correspondent.

GLASGOW, *Saturday*.

When addressing his constituents lately, as a retiring member of the Glasgow Corporation, and as a candidate for re-election, Councillor Chisholm, an active member of the Gas and Electric Lighting Committee, told them that one of the subjects in which he had taken a great interest was the annual charge against the ratepayers of the city, varying from £8000 to £10,000, in connection with the lighting of the common stairs. The same meeting was addressed by ex-Bailie Wallace, one of his colleagues, who had been a member of a Town Council deputation to the Electrical Exhibition at Frankfort. He enlarged on what the deputation had seen in the way of bringing an electric current of 20,000 volts overhead from Lauffen, a distance of upwards of 100 miles, partly to be used for the electric lighting of the exhibition; and he seemed strongly in favour of the Falls of Clyde being utilized for electric lighting in Glasgow, and for other purposes.

A propos of the last-mentioned question, I may state that Professor A. B. W. Kennedy, C. E., F.R.S., late of University College, London, who has recently carried out the installation for the Westminster Electric Lighting Company, was in this city to-day having an interview with the Glasgow Electric Lighting Committee, at the suggestion of Sir William Thomson, by whom he is regarded as a very capable man to take in hand and devise a scheme for the "compulsory area" which is scheduled in the Glasgow Electric Lighting Provisional Order. Sir William is in favour of the low-tension continuous current system being adopted by the Electric Lighting Committee for their public supply; and they have readily fallen in with the distinguished Professor's recommendation. The interview which Professor Kennedy had with the Committee was of an interesting and very practical character; and the conference broke up on the understanding that he would proceed forthwith to devise a general plan for the approval of the Committee. Councillor James Bell, the Convener of the Committee, and several other prominent members of the Gas and Electric Lighting Committee were present, as also Mr. Foulis and Mr. Arnot, the recently-appointed Electrical Engineer. Professor Kennedy gave the Committee to understand that it would be quite possible to work out the scheme within the two years allowed by the Provisional Order, and which will expire in the month of August next year.

At the municipal election meetings held in Paisley this week, several of the Town Councillors dealt with gas matters. Bailie Brough, at the First Ward, meeting remarked that one of the great contracts of the past municipal year was for the extension of the gas-works. On the new gasholder there had been laid out £32,031; and so far from any increase in the price of gas on that account, their surpluses had been continued, as formerly, and the charge per 1000 cubic feet was lower than ever it was in the history of the town. The past year's surplus of £8238 had not yet been allocated; and while he favoured a reduction of the debt on the works, and also in the price of gas, he would, he said, continue the expenditure of one or two thousand pounds in carrying out those improvements which had conduced so much to the present superior position of the town. Councillor Macfarlane, the Convener of the Gas Committee, addressed the same meeting; and in speaking of the great importance of the Gas Trust, he said that the increase in the consumption of gas amounted to 17 million cubic feet over the previous year. Marvellous success had attended the operations of the gas-works of late years. Notwithstanding the large increase in the price of coal, the surplus at last year's balance amounted to £8236. More than one-fifth part of all the revenue was profit. That being so, the speaker thought it was a good opportunity, when the price of gas for the year was being fixed by the Council, that the consumers should have a substantial reduction. He was himself prepared to fix the price at 2s. 6d.; but some of his colleagues thought that he would not be able to carry the Council with him at that figure. He agreed, therefore, to move that it be 2s. 8d. per 1000 feet; but even that was not carried. If the price of gas had been fixed at 2s. 6d., the surplus at the close of the current year would have been £4000—surely sufficient to satisfy the most ardent admirer of the principle of keeping the surplus for town improvements.

Ex-Provost Cochran, who is a great advocate of gas profits going to town improvements in Paisley, also addressed a meeting of his ward electors during the week. He referred in the course of his remarks to the great prosperity of the Gas Trust; stating that their gas was the cheapest in Scotland. He went on to say that they had made Johnston Street out of gas profits; and they were erecting a reception house in the Sneddon, the cost of which would come out of the Gas Trust profits. The larger consumers did not complain. Why should they, when the gas was the cheapest in the country? If they did away with the surplus, they did away with the improvements.

The Glasgow pig-iron market has been quiet during the past week; and Scotch warrants have remained unchanged in price at 47s. per ton, at which there were some buyers at the close yesterday. Rather more business has been done in Cleveland and hematite iron.

No material change has taken place in the local coal trade during the week. There is a good demand all round; and prices remain firm, becoming even higher in some instances.

The Artesian Well in the City.—At the meeting of the Commissioners of Sewers of the City of London last Tuesday, the Engineer reported that the boring in the artesian well in Aldgate had been continued another 40 feet; and he expressed the opinion that there was every prospect of a large supply of water being obtained.

The Gas-Works Purchase Question at Cleator Moor.—At their meeting on Monday last week, the Cleator Moor Local Board, on the recommendation of the Parliamentary Committee, resolved to make application to Parliament in the ensuing session for leave to bring in a Bill to sanction and confirm an agreement made between the Cleator Moor Gas Company and the Board, as to the transfer of the gas-works.

West Bromwich Gas Supply.—A proposal is being made to spend £30,000 on the improvement of the West Bromwich Gas-Works; and this is causing the whole gas question in the borough to be thoroughly considered. It has consequently occupied a conspicuous place among the items of public expenditure discussed at the meetings which have been held in connection with the annual municipal elections. Some particulars have been given relative to the scheme. At present it appears that £173,080 have been spent on the works; and towards this only £11,745 has been returned. At this rate of repayment, it is estimated that it will take 40 years to clear off the debt. In addition to this sum, however, £16,641 had been paid to the relief of the rates, and £4000 have been put to the depreciation fund. For the year ending March, 1891, the gross profit made on the year's business was £9266. Of this sum £5325 was absorbed in paying interest on mortgages, &c.; and £2115 was added to the sinking fund for the redemption of loans—leaving a net profit of £1825. This was a considerable decrease compared with the previous year, due to £2860 extra having to be paid for coal, and £1100 or additional wages, in consequence of the reduction in the number of hours the stokers were employed. The chief reason assigned for the alterations and enlargements was that there is not sufficient storeage room at the works to ensure a constant supply of gas to the town.

CURRENT SALES OF GAS PRODUCTS.

LIVERPOOL, *Oct.* 24.

Sulphate of Ammonia.—The market seems to be slowly improving. Prices have hardened a little; thus indicating that the turning point has come, and there is a little better inquiry all round. Continental buyers are on the *qui vive;* but their low ideas generally prevent business. There is, however, a general desire on the part of both consumers and dealers to secure prompt and forward parcels; and it is a healthy symptom that 7s. 6d. to 10s. per ton premium is being paid for spring delivery. Makers generally are looking for better prices than those now offered; and the position of nitrate seems to warrant a steady, if slow, improvement in the sulphate market. For spot delivery £10 12s. 6d. is now the lowest price; and for spring delivery £11 is reported to have been paid. Nitrate is firm at 9s. 1½d. per cwt.

LONDON, *Oct.* 24.

Tar Products.—The chief feature in this market is the continued dulness of benzol. Buyers appear to have withdrawn from the market; and apparently seem to be waiting for lower prices than are quoted below. There can be no doubt this product is being unduly depressed. As there are no stocks, and the demand for aniline is said to be fairly good, distillers are hopeful that, as the season advances, better prices will be realized for this article, especially for next year's delivery. Pitch shipments continue active; and this article is firm. There is a better demand for common oils; and although anthracene continues weak in price, there appear to be buyers at the quotations mentioned below. To-day's prices are: Tar, 23s. to 25s. Pitch, 33s. 6d. to 35s. Benzol, 90's, 3s. 7d.; 50's, 2s. 6d. Toluol, 1s. 4d. Solvent naphtha, 1s. 4d. Crude naphtha, 1s. 1d. Creosote, 1¼d. Carbolic crystals, 6d.; crude, 60's, 1s. 1½d. Cresol, 7½d. Anthracene, "A" quality, 1s. 2d.; "B," 10d.

Sulphate of Ammonia.—The price of sulphate shows a slight improvement; and business in it is decidedly better. Important sales are noted at prices varying from £10 8s. 9d. to £10 12s. 6d., less 3½ per cent., according to port of shipment, and conditions of sale. It is believed that prices have touched bottom; and buyers are anxious to book forward business at about 10s. on to-day's price. Gas liquor is quoted at 4s. to 5s.

THE LANCASHIRE GAS COAL TRADE.

From Our Own Correspondent.

There is no material change to report with regard to the coal trade of the Lancashire district; the better qualities, suitable for house-fire purposes, continuing in active demand, with prices firm at late rates. Best Wigan Arley averages 12s. 6d. to 13s. per ton in some instances; Pemberton four-feet coals and second qualities of Arley, 10s. 6d. to 11s. per ton; and common house-fire coals, 9s. to 9s. 6d. per ton at the pit's mouth. The lower descriptions of round coal are moving off but moderately for iron-making, steam, and general manufacturing purposes; but the increasing consumption for gas making, and the scarcity of some of the better qualities suitable for house-fire consumption, is necessarily tending to take off the market a good deal of common round coal which would otherwise be offering for steam and forge purposes. Notwithstanding this, supplies are ample for present requirements; and prices are not more than maintained at about 8s. to 8s. 6d. per ton at the pit's mouth. Engine classes of fuel remain the chief difficulty in the market, and surplus supplies are pushed so much for sale at excessively low figures, that list rates are practically little more than nominal, while slack contracts for next year are only obtainable at considerable reductions upon last season's prices; colliery proprietors having, in many instances, to give way fully 1s. 6d. to 2s. per ton. For current sales, prices scarcely average more than 6s. to 6s. 6d. for burgy, and 5s. to 5s. 6d. for good qualities of slack, with common sorts readily obtainable in special lots at from 2s. 6d. and 3s. per ton and upwards. The shipping trade has been somewhat disorganized by the recent stormy weather; but there is a fair weight of orders in hand to execute, and prices remain steady at about 9s. 6d. to 10s. per ton for steam coal delivered at the ports on the Mersey.

Northern Coal Trade.—There is still easiness in the northern coal trade, and rather lower prices are quoted for steam and bunker coal. The falling off of the Baltic coal trade is most felt in the Northumberland district; and to keep some collieries fully at work, as low as 11s. per ton, free on board, has been taken for best steam coal. Small steam coal is weak at about 4s. per ton. Gas coal is in good and increasing demand, the shipments to the South, as well as the local consumption, being larger, and for best Durham qualities, from 9s. 6d. to 10s. per ton, free on board, is the current price. The output is large, but is very well taken up; and there is likely to be rather more scarcity in about a month's time. For bunker coals, with a full production the inquiry is rather limited, and the price weak—varying from 8s. 3d. for unscreened, up to 12s. for the best Durham screened. For manufacturing coal, there has been a rather better demand; but the possibility of a serious strike in the engineering trade is rather limiting it. Coke is steady for best blast-furnace qualities at from 15s. 6d. to 16s. per ton, free on board. In gas coke, there is as yet no alteration; but lower prices for contracts are expected soon.

Sale of Gas-Works at Measham (Derbyshire).—Last Tuesday, Messrs. Smith and Wilson, of Birmingham, sold by auction the small freehold gas-works at Measham. The property has an area of 5100 square yards, and contains gas-making plant having a capacity of 3 million cubic feet. There was also included in the sale the whole of the gas-mains from the works into the town; and the gas-pipes, lamp-posts, and brackets in the streets. The property was offered in one lot, and fetched £445. The purchaser was required to take the meters in use and at the works, a small stock of gas-piping, moveable tools, and effects, at a valuation which was named by the auctioneer at £113, making a total of £558.

The Projected New Gas-Works for Stoke.—At the meeting of the Stoke Town Council last Thursday, among the minutes presented by the Gas Committee was the following resolution, passed at a special meeting of the Committee held on the 13th inst.: "That this Committee, having considered the several proposed sites for the erection of a new gas-works, are of opinion that the land situate on the west side of North Street, as shown on the plan prepared by the Manager [Mr. Herman Taplay, Assoc. M. Inst. C. E.], and containing six acres or thereabouts, is the best site within the borough therefor, and that the Town Clerk be instructed to negotiate for the purchase of such land, with a view to provisional contracts being entered into." In connection with this question, a statement has been issued by the Gas Committee setting forth in detail the present position and capacities of the gas-works. It is stated that the rapid increase in the consumption of gas was placing the Committee in a decidedly worse position than they were in at the time the works were transferred to the towns of Stoke and Fenton in 1878. In that year the make of gas for the two towns was 83,322,000 cubic feet. Last year the make for Stoke alone was 95,195,000 cubic feet. At the time of the separation between Stoke and Fenton in 1883, one of the three gasholders, of the capacity of 110,000 cubic feet, was apportioned to Fenton. This reduced the storeage of Stoke to the present amount—viz., 350,000 cubic feet only; while the daily delivery last winter rose to 539,000 cubic feet Since the works had been transferred, Stoke had profited to the amount of £48,942 4s. 2d., principally in relief of the rates, but including the reserve fund and reduction of capital. An additional gasholder was an immediate necessity, the simple erection of which, however, would not effect any economy, but would rather embarrass the Committee by causing them to provide interest and a sinking fund on the capital outlay, without being able to reduce the expenditure. In addition, a large amount of money would have to be spent on the present works. If, on the other hand, the Committee were empowered to spend additional capital on new works, beyond what would be required for a new holder and in partly re-building the present works, the economy effected would meet the interest and sinking fund on the new capital. A special meeting was called for yesterday, to consider the question of erecting new works.

GAS AND WATER COMPANIES' STOCK AND SHARE LIST.

(For Stock Market Intelligence, see ante, p. 730.)

Issue.	Share	When ex-Dividend.	Dividend or Div. Bonus.	NAME	Paid per Share	Closing Prices.	Rise or Fall in Wk.	Yield upon investment.
£			p. c.	GAS COMPANIES.				£ s. d.
590,000	10	15 Oct.	10½	Alliance & Dublin 10 p. c.	10	16—17*	..	6 3 6
100,000	10	,,	7½	Do. 7 p. c.	10	11½—12½*	..	6 0 0
300,000	100	1 July	5	Australian (Sydney) 5 % Deb.	100	106—108	+1	4 12 7
100,000	20	28 May	8	Bahia, Limited	20	13—15	..	10 13 4
200,000	5	13 May	7½	Bombay, Limited	5	6¾—7¼	..	5 3 5
40,000	5	,,	7½	Do. New	4	4¾—5¼	..	5 14 1
380,000	Stck.	13 Aug.	12½	Brentford Consolidated	100	215—225	..	5 8 10
125,000	,,	,,	9½	Do. New	100	157—162	..	5 14 2
220,000	20	16 Sept	11½	Brighton & Hove Original	20	40—42	..	5 9 6
444,250	Stck.	16 Sept.	10	Bristol	100	208—213	..	4 13 11
320,000	20	15 Oct.	11½	British	20	44—46*	..	4 17 10
50,000	10	28 Aug.	11½	Bromley, Ordinary 10 p. c.	10	18—20	..	5 15 0
50,380	10	,,	8½	Do. 7 p. c.	10	13—15	..	5 13 4
328,750	10	13 Nov.	6	Buenos Ayres (New) Limited	10	6¾—7¼	−¼	— —
200,000	100	1 July	6	Do. 6 p. c. Deb.	100	90—95	..	6 6 4
150,000	20	13 Aug.	8	Cagliari, Limited	20	24—26	..	6 3 1
550,000	Stck.	15 Oct.	13¾	Commercial, Old Stock	100	215—245*	..	5 12 3
161,396	,,	,,	10¾	Do. New do.	100	185—195*	..	5 10 3
130,000	,,	26 June	4½	Do. 4½ p. c. Deb. do.	100	119—124	..	3 12 7
800,000	Stck.	11 June	10	Continental Union, Limited	100	220—230	−5	4 6 11
200,000	,,	,,	7	Do. 7 p. c. Pref.	100	190—200	..	3 10 0
75,000	Stck.	16 Sept.	10	Crystal Palace District	100	190—200	..	5 0 0
486,090	10	15 July	10	European, Limited	10	20—21	..	4 15 3
354,060	10	,,	10	Do. Partly paid	7½	14½—15½	..	4 16 9
5,470,640	Stck.	13 Aug.	13	Gaslight & Coke, A, Ordinary	100	218—223	+10½	5 16 7
100,000	,,	,,	4	Do. B, 4 p. c. max.	100	94—97	..	4 2 5
665,000	,,	,,	10	Do. C, D, & E, 10 p.c. Pf.	100	251—256	..	3 18 1
30,000	,,	,,	5	Do. F, 5 p. c. Pri.	100	118—123	..	4 1 4
60,000	,,	,,	7½	Do. G, 7½ p. c. do.	100	172—177	..	4 4 9
1,300,000	,,	,,	7	Do. H, 7 p. c. max.	100	155—160	..	4 7 6
463,000	,,	,,	10	Do. J, 10 p. c. Prf.	100	250—255	..	3 18 5
476,000	,,	,,	—	Do. K, 6 p. c. Prf.	100	145—155	..	3 17 5
1,061,150	,,	11 June	4	Do. 4 p. c. Deb. Stk.	100	112—115	..	3 9 7
294,850	,,	,,	4½	Do. 4½ p. c. do.	100	120—125	..	3 12 4
908,000	,,	,,	6	Do. 6 p. c. do	100	163—168	..	3 11 5
3,800,000	Stck.	13 May.	12	Imperial Continental	100	220—225	+2	5 6 8
75,000	5	26 June	6	Malta & Mediterranean, Ltd.	5	4¼—4¾	..	6 6 4
560,000	100	1 Oct.	5	Met. of Melbourne, 5p. c. Deb.	100	109—111	..	4 10 1
541,920	20	11 June	6½	Monte Video, Limited	20	16½—17½	..	7 8 6
150,000	5	28 May	10	Oriental, Limited	5	8¼—8¾	..	5 14 3
60,000	5	30 Sept.	7	Ottoman, Limited	5	4—5	..	7 0 0
166,870	10	26 Feb.	2	Pará Limited	10	2½—3½	..	— —
420,000	100	4 May	6	People's Gas of Chicago— 1st Mtg. Bds.	100	92—97	..	6 13 9
500,000	100	1 June	16	2nd Do.	100	90—95	..	6 6 4
150,000	10	15 Oct.	10	San Paulo, Limited	10	13—14*	−½	7 2 10
500,000	Stck.	28 Aug.	15½	South Metropolitan, A Stock	100	255—265	..	5 17 0
1,350,000	,,	,,	12	Do. B do.	100	215—225	..	5 6 8
200,000	,,	,,	13	Do. C do.	100	225—235	..	5 10 8
700,000	,,	26 June	5	Do. 5 p. c. Deb. Stk.	100	141—145	..	3 9 0
603,000	Stck.	16 Sept.	11½	Tottenham & Edm'nton, Orig.	100	—	..	—
				WATER COMPANIES.				
729,281	Stck.	26 June	10	Chelsea, Ordinary	100	265—270	..	3 14 1
1,720,560	Stck.	15 Oct.	8	East London, Ordinary	100	204—209*	−½	3 16 7
544,440	,,	26 June	4½	Do. 4½ p. c. Deb. Stk.	100	138—143	..	3 3 0
700,000	50	11 June	8	Grand Junction	50	105—110	−½	3 12 9
708,000	Stck.	13 Aug	10½	Kent	100	265—275	..	3 16 4
1,043,800	100	26 June	9½	Lambeth, 10 p. c. max.	100	236—241	−1	3 18 10
406,200	100	,,	7½	Do. 7½ p. c. max.	100	195—200	+2	3 15 0
360,000	Stck.	30 Sept.	4	Do. 4 p. c. Deb. Stk.	100	118—121	..	3 6 1
500,000	100	13 Aug.	12½	New River, New Shares	100	341—346	..	3 10 1
1,000,000	Stck.	30 July	4	Do. 4 p. c. Deb. Stk	100	123—126	..	3 3 6
902,300	Stck.	11 June	6½	S'thwk & V'xhall, 10 p. c. max.	100	165—170	..	3 16 5
126,500	100	,,	6½	Do. 7½ p. c. do.	100	160—165	..	3 18 9
1,155,066	Stck.	11 June	10	West Middlesex	100	252—257	−1	3 17 10

*ex div.

Electric Lighting for Huddersfield.—The Huddersfield Town Council last Wednesday decided to make application to the Local Government Board for power to borrow £50,000 for electric lighting purposes; but the Gas Committee were asked to see, before absolutely borrowing the money, what the Finance Committee could do to provide it.

Gas Exhibition at Bedford.—Last Tuesday a very successful exhibition of gas appliances, under the auspices of the Bedford Gas Company, was opened by the Chairman (Mr. G. Hurst), who, although 92 years of age, delivered a most interesting and instructive speech on the advance of gas for domestic uses. The exhibits were furnished by Messrs. Richmond and Co., of Warrington; and Mr. E. W. T. Richmond followed the Chairman with an address on "The Uses and Abuses of Gas Cooking." Cookery lectures were given twice daily by Miss E. E. Golding; and were highly appreciated. The exhibition, which was well attended, closed on Friday.

Serious Accident at the Coleraine Gas-Works.—Last Tuesday night, about half-past eleven o'clock, an explosion took place at the Coleraine Gas-Works, with fatal results to one man. A new retort stack had been put in; and four workmen—James Miller and John Stockman, fitters in the Coleraine Foundry, with a plumber named Allan Mitchell, and John Barber, a smith—were connecting it with the condenser, when an explosion occurred, injuring the men, and damaging the roof and interior of the building. The force of the explosion threw Mitchell back about six yards; and he was slightly burned about the right cheek. James Miller received serious injuries. His right leg was broken at the thigh, and he was otherwise hurt about the body. Stockman's wounds were slight, and both he and Mitchell walked home. Miller was removed to his residence, where, unfortunately, he died on Friday evening; his case having been hopeless from the first. Mr. W. S. Stormonth, the Gas Manager, was present while the work was proceeding; but he had left the premises just before the occurrence.

Westhoughton in Darkness.—Consequent upon the strong winds that prevailed during the previous day or two, the greater part of the township of Westhoughton was on the night of Wednesday, the 14th inst., suddenly left without any gas illumination. Shortly after eight o'clock, when the consumption was greatest, the holder at the Gas Company's works was noticed to have tilted somewhat on one side. Serious results being feared, the principal supply was at once cut off; nearly the whole of the street lamps and the lights in private houses being extinguished together. Services were also being held at many of the places of worship; and these were also left in darkness—the congregations having to find their way out with the aid of matches and tapers. Darkness prevailed until half-past ten, when the illumination of the township was partially restored, much to the relief of the population. The holder which met with the mishap has been in use for many years; and though it has been the only one in existence at the works, until recently it has answered the requirements of the district. A few months ago, however, the Directors, being desirous of meeting the increasing wants of consumers, and seeing the importance of having more than one holder to rely upon, commenced the construction of a larger one, which is almost completed. It will hold about 200,000 cubic feet of gas—nearly four times as much as the original holder.

GWYNNE & BEALE'S PATENT GAS EXHAUSTERS AND ENGINES.

Telegrams: "GWYNNEGRAM LONDON."

GWYNNE & CO.,

TELEPHONE No. 2698.

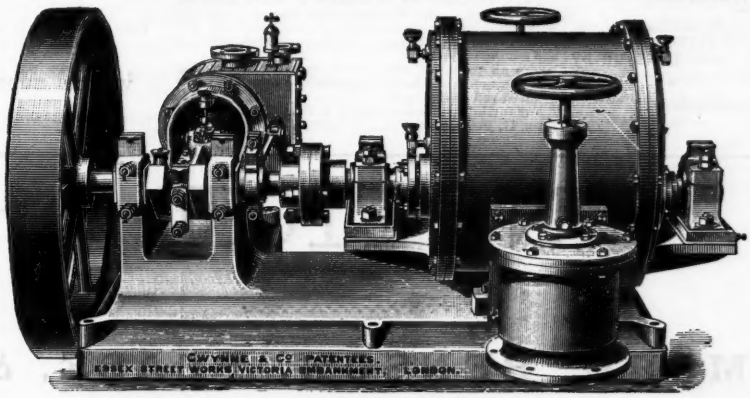
HYDRAULIC AND GAS ENGINEERS, ESSEX STREET WORKS, VICTORIA EMBANKMENT, LONDON, W.C.

Thirty-three Medals at all the Great International Exhibitions have been awarded to GWYNNE & Co., for Gas Exhausters, &c.

They have never sought to make price the chief consideration, but to produce Machinery of the very highest quality.

The result is that in every instance their work is giving the fullest satisfaction.

They have completed Exhausters to the extent of 30,000,000 cubic feet passed per hour, which are giving unqualified satisfaction in work, and can be referred to.



Engine and Exhauster Combined on One Bed-Plate.

GWYNNE & Co.'s Exhausters are constructed of large size to pass the required quantity of Gas at very slow speeds; the wear and tear being reduced to a Minimum.

Catalogues and Testimonials sent on Application.

Their Exhausters can be made, when desired, on their New Patent Principle, to pass Gas without the slightest oscillation or variation in pressure.

NO OTHER MAKER CAN DO THIS.

Makers of GAS-VALVES, HYDRAULIC REGULATORS, VACUUM GOVERNORS, STEAM-PUMPS for Tar, Liquor, or Water; PATENT SELF SEALING AND CLEANSING RETORT-LIDS AND MOUTHPIECES; CENTRIFUGAL PUMPS and PUMPING ENGINES, specially adapted for Water-Works, raising Sewage, &c.

Also GIRARD and other TURBINES, HIGH-SPEED ENGINES, DYNAMOS, &c., &c., for ELECTRIC LIGHTING.

NOTICE TO ADVERTISERS.—COPY FOR ADVERTISEMENTS for the "JOURNAL" should be received at the Office *not later* than TWELVE O'CLOCK NOON ON MONDAY, to ensure insertion in the following day's issue.

Orders for Alterations in, or Stoppages of PERMANENT ADVERTISEMENTS should be received not later than the FIRST POST on SATURDAY.

OXIDE OF IRON.

O'NEILL'S Oxide has a larger annual sale in the United Kingdom than all other Oxides combined. Purity and uniformity of quality guaranteed. Pamphlet, "How to Purchase Bog Ore," to be obtained on application.
Gas Purification and Chemical Company, Limited, Palmerston Buildings, Old Broad Street, London, E.C.
JOHN WM. O'NEILL, Managing Director.

GAS PURIFICATION AND CHEMICAL COMPANY LIMITED.

ANDREW STEPHENSON, Agent.
Please address all communications to the Company, as above.

ANDREW STEPHENSON, Agent for BRIN'S OXYGEN COMPANY, Limited, Westminster, S.W.
City Address: 182, Gresham House, Old Broad Street, LONDON, E.C.

HUTCHINSON BROTHERS, Barnsley, Gas Engineers and Contractors, Makers of Wet and Dry Gas-Meters and General Gas Apparatus, Sulphate of Ammonia Plant, Lead Saturators, Tanks, &c., Tools and Sundries.

CANNEL COAL, ETC.

JOHN ROMANS & SON, EDINBURGH.
Gas Engineers, supply all the most approved SCOTTISH CANNELS; also FIRE-CLAY GOODS, CAST-IRON PIPES, and other APPARATUS for GAS AND WATER WORKS.
Prices, &c., will be forwarded on application to No. 80, ST. ANDREW SQUARE, EDINBURGH, NEWTON GRANGE, NEAR DALKEITH, } SCOTLAND.

JAMES LAWRIE & CO. supply Best SCOTCH CANNEL COALS, Best FIRE-CLAY RETORTS, BRICKS, TILES, and LUMPS; BOILER SEATING BLOCKS, FLUE COVERS, and SILICA BRICKS for SPECIAL FURNACE WORK; COKE BARROWS, BOGIES, and SMALL WAGONS.
Postal Address: 1, WHITTINGTON AVENUE, E.C.
Telegram Address: "EIRWAL LONDON."

W. C. HOLMES & Co., Huddersfield, AND 80, CANNON STREET, LONDON, Contractors for Gas-Works complete, Makers of Gasholders, Purifiers, Scrubbers, Condensers, Retort Fittings, &c., Improved Valves, Engines, and Exhausters. Also for Collingwood's Regenerative Retort-Settings.
*** See Advertisement p. 742 of this week's issue.
Cablegrams: "Ignitor London." Telegrams: "Holmes Huddersfield."

TUBES.

FOR Gas, Steam, and Water; Galvanized, White Enamelled, and Hydraulic Tubes, &c.
JOHN SPENCER, Globe Tube Works, WEDNESBURY, and 14, Great St. Thomas Apostle, LONDON.

J. & J. BRADDOCK, Globe Meter Works, Oldham.
First-Class Award, Melbourne Exhibition, 1889, for WET AND DRY GAS-METERS, STATION METERS, AND GOVERNORS, PRESSURE-GAUGES, STREET LAMPS AND PILLARS, &c.
Telegraphic Address: "Braddock, Oldham."

JOHN RILEY & SONS, Chemical Manufacturers, Hapton, near Accrington, are MAKERS of SULPHURIC ACID, from Brimstone, for Sulphate of Ammonia making. Highest percentage of Sulphate of Ammonia obtained from the use of this Vitriol. References given to Gas Companies.

IRISH BOG ORE OXIDE OF IRON.

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BALE, BAKER, & CO., direct Importers from Ireland. Sample and Price on application.
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SULPHURIC ACID.

JOHN NICHOLSON & SONS, Chemical Works, LEEDS, specially produce this ACID from BRIMSTONE, for making SULPHATE OF AMMONIA of high quality and *good* colour. Delivery in our own Railway Tank-Wagons or Carboys. Highest references and all particulars supplied on application.

OXIDE OF IRON. Genuine Natural Bog ORE. QUALITY AND CONDITION GUARANTEED. Any quantity supplied at lowest rates.
D. M. NELSON AND SONS, GLASGOW. Telegraphic Address: "Gas Glasgow." Depôts throughout England and Scotland.

COZE'S Automatic Apparatus for CHARGING AND DISCHARGING GAS-RETORTS. For Illustrated Advertisement of this System, see p. 642.
Inquiries should be addressed to THE AUTOMATIC COAL-GAS RETORT COMPANY, LIMITED, 86-88A, LEADENHALL STREET, E.C.

WANTED, by a young Man (aged 21), son of a Gas Manager, and just returned from Canada, a Situation as INSPECTOR, SERVICE and MAIN LAYER, &c. Has been brought up in a Gas-Works, and is well acquainted with the whole routine. Should prefer to go abroad.
Apply by letter, to No. 2018, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

WANTED, a good Gas-Fitter in Compo and Iron Pipes, Main and Service laying, fixing Meters, Gas-Stoves, &c.
Apply to the MANAGER, Glastonbury Gas and Coke Company, GLASTONBURY.

WANTED, a Gas-Fitter, well up in Indoor Gas-Fittings, also in the laying of Service-Pipes, and work generally required by a Gas Company. Applicant must be steady, and of good character. One brought up by a Gas Company preferred. Constant employment to a suitable man.
Apply, stating age, experience, and wages required, to Mr. STONE, 40, St. Thomas Street, WEYMOUTH.

THE Gorleston and Southtown Gas Company are open to engage a young man for Five years as an APPRENTICE to learn Gas Making in all its branches. Premium required.
Apply to W. PALGRAVE BROWN, Secretary, Southtown, GREAT YARMOUTH.

DRAUGHTSMAN required. One accustomed to (details, &c.) Retort-Settings and General Ironwork.
Apply, stating experience and terms, to THE AUTOMATIC COAL-GAS RETORT COMPANY, LIMITED, 88A, Leadenhall Street, LONDON, E.C.

CAPE TOWN AND DISTRICT GASLIGHT AND COKE COMPANY, LIMITED.

NOTICE TO APPLICANTS FOR SITUATION AS SERVICE LAYER, GAS-FITTER, &c.

THIS Situation has been filled up by the appointment of Mr. W. Humphries, of the Midland Railway.

By order of the Board,
J. A. KELMAN
Secretary.

MORECAMBE GAS AND LIGHT COMPANY.

WANTED, 1132 yards of 12-inch Turned and Bored MAINS; and 20 tons of OXIDE of IRON.
FOR SALE, 35 tons of SPENT OXIDE; and 10 tons of SULPHATE of AMMONIA.
For particulars apply to WM. DUFF, Secretary and Manager.

RAILWAY Tank-Wagons, nearly new, for Ammoniacal Liquor or Tar. To sell or to let.
Address No. 2020, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

FOR SALE—A Cowan 500-light Wet GAS-METER, 8000 feet per hour. Complete with Fittings, and in perfect condition. But little used.
Address J., 55, Winchester House, Old Broad Street, LONDON, E.C.

FOR SALE—One Reciprocating Pump Exhauster, with Steam-Engine combined, to pass 30,000 cubic feet per hour, with 12-inch Bye-Pass Valves and Connections.
One ROTARY EXHAUSTER, to pass 15,000 cubic feet per hour, with Steam-Engine combined, upon Cast-Iron Bed-Plate, with a Governor to regulate Steam and Gas Compensating Valve, with 8-inch Bye-Pass Valves and Connections.
One ROTARY EXHAUSTER, Steam-Engine combined, to pass 5000 cubic feet per hour with 6-inch Valves and Connections.
The whole of the above are new, and are of high-class finish. The materials and workmanship are of the very best description. The Exhausters can be seen at work.
Two CAST-IRON SCRUBBERS, 10 feet in diameter, 40 feet high, with Wrought-Iron Domes. All the Scrubber-Plates are machine planed; and all the materials and workmanship are of the best description and can be inspected.
The above is an exceptional opportunity for Gas Companies or Corporations purchasing absolutely new Plant at reduced prices.
For further particulars apply to No. 2021, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

WANTED, a Gasholder, 30 feet diameter, and 15 feet high.
Address, stating cost, time of delivery, and all particulars to the STANTON IRON-WORKS COMPANY, near NOTTINGHAM.

COCKERMOUTH GAS-WORKS.

ON SALE—A number of second-hand RETORT-FITTINGS, including Mouthpieces, Ascension-Pipes, Hydraulic Mains, &c., at the above Gas-Works.
Further particulars on application to the undersigned,
ER W. SMITH,
Manager.
Oct. 17, 1891.

FOR SALE, the following Plant:—
Three lengths of Hydraulic Main for Settings of five Retorts.
15 Dip-Pipes.
15 H-Pipes.
15 Ascension-Pipes.
10 Mouthpieces.
Retort-Lids.
Sight-Boxes.
Also a small Weighbridge (Pooley's Patent).
Apply to the MANAGER, Gas-Works, SUNBURY.

OAKHAM GAS COMPANY.

THE Directors of the Oakham Gas Company, Ltd., invite TENDERS for the surplus TAR and AMMONIACAL LIQUOR during the year ending Sept. 30, 1892, delivered into Purchaser's tanks at Oakham Station.
Coal carbonized, about 700 tons.
Tenders to be addressed to the undersigned, from whom all particulars may be obtained.
JAS. MASON,
Manager.
Oakham, Oct. 24, 1891.

8vo., Price 1s.

WATER SUPPLY AND SEWAGE.
Short Notes for Non-Technical Readers.
By EDMUND J. MILLS, D.Sc., F.R.S.
London: GURNEY AND JACKSON.

NOTICE.

ASHMORE, BENSON, PEASE, & CO.,

Limited, have ceased to Manufacture Davis's Patent Still, and HAVE BROUGHT OUT A NEW STILL much cheaper, and far more efficient.

Now Ready, price 15*s., limp cloth, the Eleventh Yearly*

ANALYSIS OF THE ACCOUNTS
OF THE
METROPOLITAN WATER COMPANIES,

Chelsea, East London, Grand Junction, Kent, Lambeth, New River, Southwark and Vauxhall, and West Middlesex. Showing the Capital, Income, Expenditure, Profits, and Dividends per Million and per Thousand gallons of Water supplied; the proportion of Expenditure and Profits to gross Income; and the Income, Expenditure, and Profits per House, &c., supplied, for the year ended December 31, 1890, or March 31, 1891, together with the quantity of water supplied, the estimated daily quantity supplied for domestic and other purposes, the quantity supplied per head of population, &c., &c., for the year ended December 31, 1890.

Compiled and arranged by **ALFRED LASS**, Fellow of the Institute of Chartered Accountants.

LONDON: WALTER KING, 11, BOLT COURT, FLEET STREET, E.C.

TAR and Liquor wanted.
BROTHERTON AND Co., Commercial Buildings, LEEDS.

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FRIEDRICH LUX, Ludwigshafen am Rhein; and at No. 142, Great Portland Street, London, W.
LUX's Gas Regulators for every consumption.
LUX's single-stem Pressure-Gauges.
LUX's Regulator for Gas-Engines.
LUX's Gas-Balance.
LUX's new Gas Regulator for Inverted Lamps; and other Apparatus for Gas Lighting, &c.

SADLER AND CO., LIMITED, MIDDLESBROUGH; ULVERSTON (BARROW); PORTSMOUTH; CARLTON; STOCKTON; 70, Wellington Street, GLASGOW; 58, Fountain Street, MANCHESTER; and 85, Water Street, NEW YORK. Tar Distillers, Manufacturers of all TAR PRODUCTS, ALIZARINE and other TAR COLOURS, BICHROMES, OXALIC ACID, ALKALIES, LIQUOR AMMONIA, AMMONIA SULPHATE, &c.
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READY TO-DAY. PRICE ONE GUINEA.

PRECEDENTS IN PRIVATE BILL LEGISLATION AFFECTING GAS & WATER UNDERTAKINGS.

1879-1890.

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This Work (which is a continuation of that published in 1879 by the late Mr. G. W. Stevenson) contains information as to the practice of Parliament during the past twelve years, in regard to most of the points on which differences arise in Opposed Bills for Gas and Water Undertakings. The greatest care has been taken in its compilation; and it is arranged in a very handy form.

***The Work by the late Mr. G. W. Stevenson is still on sale, price One Guinea.

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AUTOMATIC COAL-GAS RETORTS.

GOLD MEDAL, PARIS EXHIBITION, 1889.

THE CHIEF ADVANTAGES CLAIMED FOR THIS PROCESS MAY BE SUMMARIZED AS FOLLOWS:—

1. **No skilled labour required.**
2. **Wear and tear of carbonizing tools reduced 50 per cent.**
3. **Great reduction in erection of Ascension-Pipes and Hydraulic Mains.**
4. **Coal carbonized one-sixth quicker than by the old process.**
5. **Absolute control of production by unskilled labour.** (This is most important, especially when there is an extra demand for Gas, as in the case of foggy days, &c.)
6. **Fifty per cent. saving in space of permanent Buildings, thus enabling an old Retort-House fitted by this System to manufacture twice the quantity of Gas.**
7. **This System enables the whole of the old Retorts, Doors, Fittings, &c., to be used (if required) where the Morris and Yan Yestraut's latest improvements are adopted.** (These improvements were described by Mr. Van Vestraut in his Paper read at the meeting of The Gas Institute in 1890. See JOURNAL for July 8, 1890.)
8. **The Morris and Yan Yestraut's System effects a reduction in the cost of carbonizing from 40d. to 10d. (average London prices) per ton of coal, or a saving of more than 70 per cent. in cost of labour.**

This System of Automatically Charging and Discharging Retorts, without machinery or arduous labour, is being largely adopted at the Works of The Gaslight and Coke Co., the South Metropolitan Gas Co., and the Brentford Gas Co., and of several of the Provincial Gas Companies and Corporations.

This Process is fully Patented, and any Infringer will be strictly proceeded against.

For further particulars apply to W. M. KIGHT, Secretary, AUTOMATIC COAL-GAS RETORT COMPANY, LTD., 86 and 88A, LEADENHALL STREET, LONDON, E.C. [See Illustrated Advt., p. 642.

PATENT SULPHATE OF AMMONIA PLANT.

C. & W. WALKER.

PATENT MURIATE OF AMMONIA PLANT.
PATENT LIQUID AMMONIA PLANT.
PATENT TAR PLANT.

Makers of the most perfect form of Apparatus for the Manufacture of Sulphate, Muriate, Liquid Ammonia, and Tar Products.
Apparatus already erected have proved more economical in consumption of Fuel, Simplicity, and Cheapness of Working than any known Plant.
Sole Makers of Claus' Patent

SULPHUR RECOVERY PLANT

for recovering Sulphur from Waste Gases containing Sulphuretted Hydrogen.
Testimonials & Estimates on Application.

8, FINSBURY CIRCUS, LONDON, E.C.; MIDLAND IRON-WORKS, DONNINGTON, NEAR NEWPORT, SHROPSHIRE.

THE TOWN OF GEFLE, SWEDEN.

THE Authorities of the above Town are desirous of receiving TENDERS for the erection of a SINGLE-LIFT GASHOLDER at their new Works. The Holder to contain about 80,000 cubic feet, and to be ready for use by the 15th of August, 1892.

Estimates, with enclosed drawings, for the above Holder, with Pipes and Valves complete, are to be sent in, to Gefle Stads Byggnadskontor, at the latest by the 20th prox.

By order of the FINANCIAL DEPARTMENT.

MOUNTAIN ASH LOCAL BOARD.

TAR AND LIQUOR.

THE Local Board invite Tenders for the surplus TAR and for the AMMONIACAL LIQUOR produced at their Gas-Works, Penrhiwceiber, for One year ending Oct. 31, 1892.

For further information, apply to Mr. John Williams, Town Hall, Mountain Ash.

Tenders to be endorsed "Tender for Tar," or "Tender for Ammoniacal Liquor," as the case may be, and sent to H. P. Linton, Esq., Town Hall, Mountain Ash, on or before One o'clock on Monday, the 9th of November next.

The Local Board do not bind themselves to accept the highest or any tender.

ARUNDEL WATER-WORKS.

TO CONTRACTORS, PIPE FOUNDERS, AND OTHERS.

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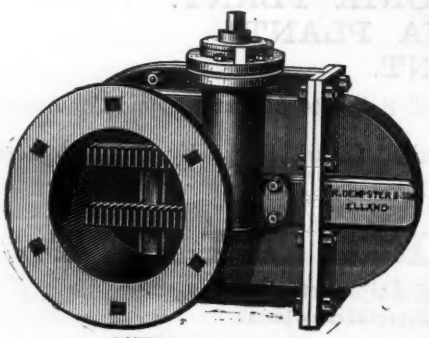

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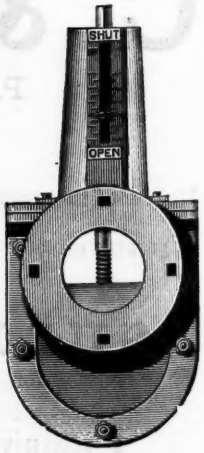

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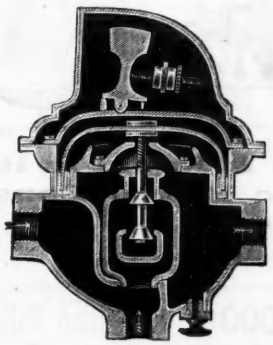

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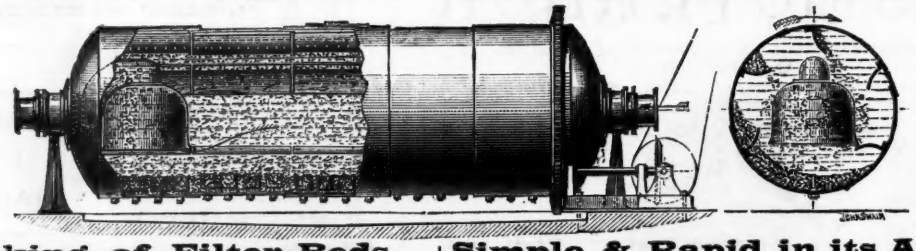

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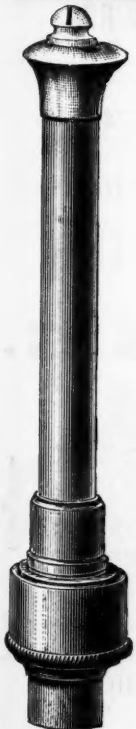

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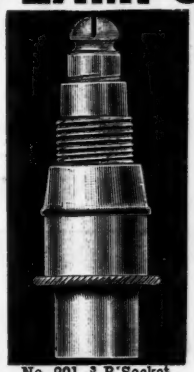

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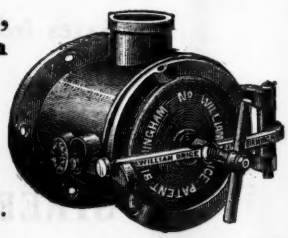

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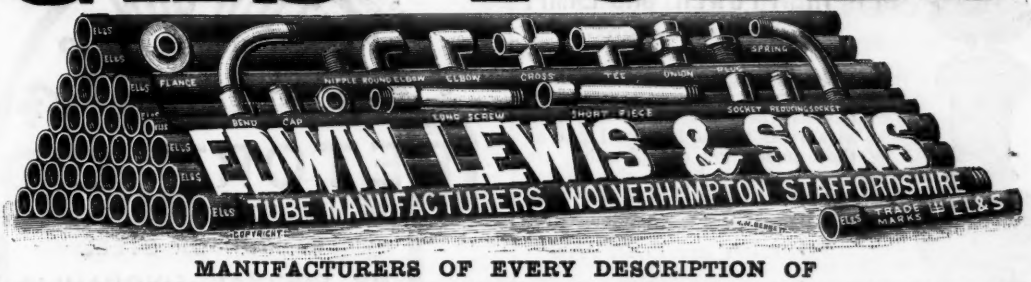

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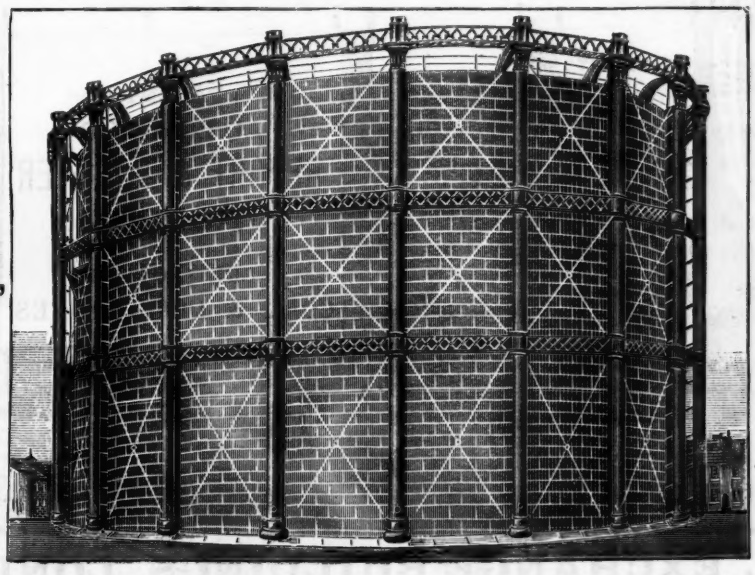

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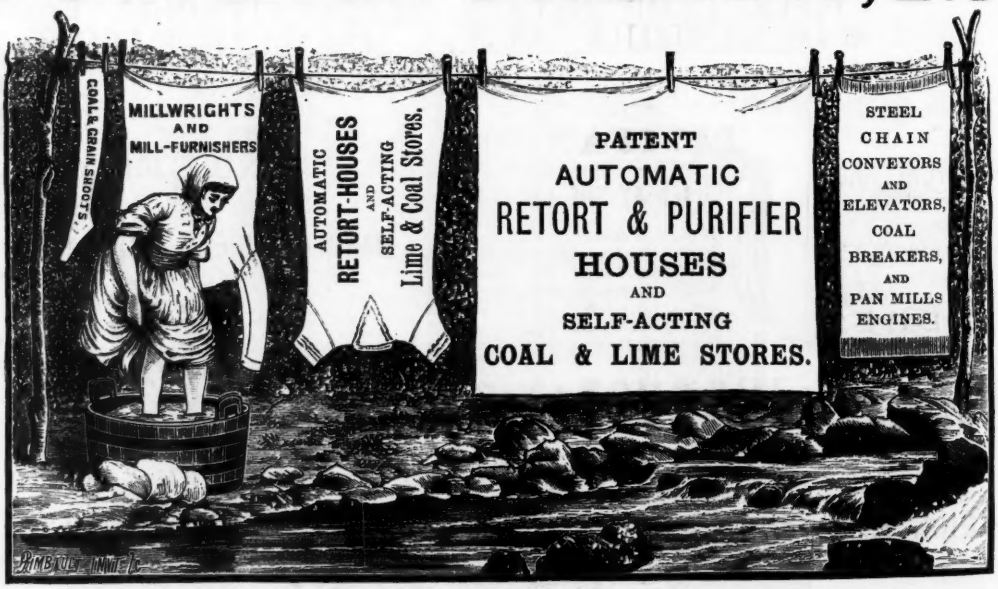
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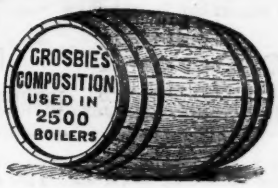

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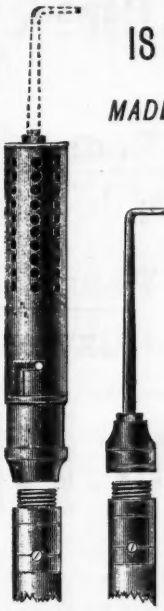

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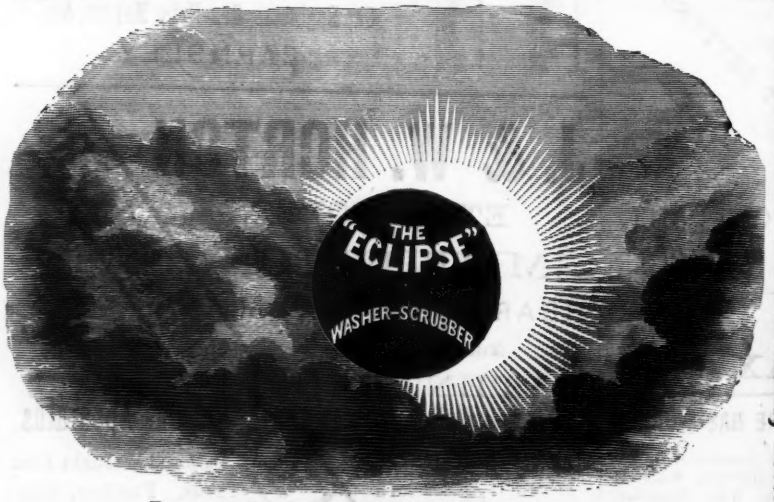

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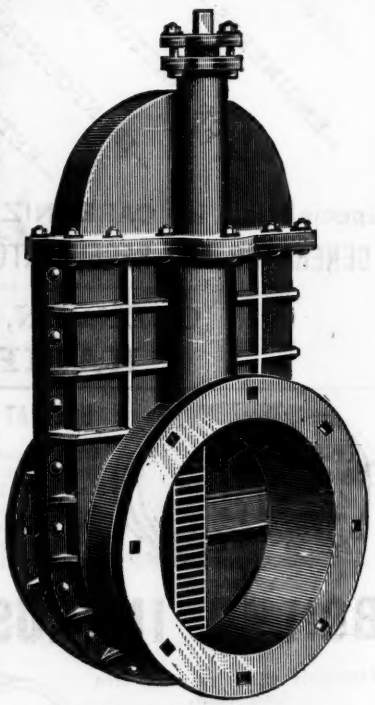

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